OTTO ENSLIN
BUCHHANDLUNG FÜR MEDIZIN
BERLIN N.W.6
KARLSTRASSE 31

8Th a.m.

Library
of the
Academy of Medicine
Toronto.
14548

1923

TRANSACTIONS

OF THE

EIGHTH ANNUAL MEETING

OF THE

AMERICAN LARYNGOLOGICAL ASSOCIATION

Secretary

With the Compliments of the ~~Publishers.~~

LIBRARY
JUL 1 8 2002
UNIVERSITY OF TORONTO

NEW YORK
D. APPLETON AND COMPANY
1887

OFFICERS

(Elected June 26, 1885)

PRESIDENT

HARRISON ALLEN, M. D., Philadelphia

1st VICE-PRESIDENT

HOSMER A. JOHNSON, M. D., Chicago

2d VICE-PRESIDENT

GEORGE W. MAJOR, M. D., Montreal

SECRETARY AND TREASURER

D. BRYSON DELAVAN, M. D., New York

LIBRARIAN

THOMAS R. FRENCH, M. D., Brooklyn

COUNCIL

MORRIS J. ASCH, M. D., New York
BEVERLEY ROBINSON, M. D., New York
FRANK DONALDSON, M. D., Baltimore
J. SOLIS-COHEN, M. D., Philadelphia

TABLE OF CONTENTS.

		PAGE
Roll Call		1
Address of Welcome		2
President's Address		2

Papers:

I.	Adenoid Disease of the Roof of the Pharynx exhibiting Unusual Features. Dr. Allen	4
II.	Lupus of the Throat. Dr. De La Sota	11
III.	Some Points connected with the Anatomy of the Larynx. Dr. Leidy	17
IV.	Concerning the Position of Paralyzed Vocal Bands. Dr. Hooper	22
V.	"Laryngeal Vertigo." Dr. F. I. Knight	34
VI.	Paralysis of the Posterior Crico-Arytenoids. Dr. J. Solis-Cohen	42
VII.	Congenital Defect of the Epiglottis. Dr. Donaldson	48
VIII.	Newer Remedies in Diseases of the Upper Air-Passages. Dr. Shurly	63
IX.	The Simplest and most Efficient Treatment of Diphtheria. Dr. Daly	73
X.	The Question of Hæmorrhage following Uvulotomy. Dr. Morgan	80
XI.	Thyreotomy. Recovery with Voice. Dr. Wagner	105
XII.	The Laryngeal Image Photographed during the Production of Tones in the Singing Voice. Dr. French	107
XIII.	Prolapse of the Laryngeal Ventricles. Dr. Major	117
XIV.	The Removal of Subglottic Laryngeal Growths. Dr. Jarvis	120
XV.	Laryngeal Œdema. Dr. De Blois	128
XVI.	Perichondritis of the Larynx. Dr. C. H. Knight	138
XVII.	Gummatous Disease of the Larynx. Dr. Holden	142
XVIII.	Gummatous Infiltration of the Base of the Tongue. Dr. Hitchcock	147
XIX.	Hysterical Sneezing by the Continuous Battery Current. Dr. S. Solis-Cohen	150
XX.	The Pathology and Treatment of the Respiratory Vaso-Motor Neuroses. Dr. Mackenzie	154
XXI.	Inflammation of the Antrum. Dr. Robinson	175
XXII.	A Case of Naso-pharyngeal Growth. Dr. S. Johnston	182
XXIII.	Tonsilar Hæmorrhage arrested by Torsion. Dr. Wagner	185

PAGE

XXIV. What Cases of Nasal Catarrh require Surgical Treatment? Dr. Rice 186

XXV. Buccal Tuberculosis, with Remarks upon Tuberculosis of the Tongue. Dr. Delavan 197

Presentation of Instruments 20

Report of Librarian 60

Appendix.

Additional Paper:

The Function of the Recurrent Laryngeal Nerve. Dr. F. Donaldson, Jr. 213

Supplementary Catalogue of the Library 226

List of Fellows 231

Business Meetings.

1st day 21

2d " 60

3d " 210

TRANSACTIONS

OF THE

EIGHTH ANNUAL MEETING

OF THE

AMERICAN LARYNGOLOGICAL ASSOCIATION,

HELD IN THE HALL OF THE COLLEGE OF PHYSICIANS, PHILADELPHIA, MAY 27, 28, AND 29, 1886.

First Day—Morning Session.

The Eighth Annual Congress of the American Laryngological Association was opened, at ten o'clock on the morning of Thursday, May 27, 1886, by the President, Dr. Harrison Allen, who occupied the chair.

The Secretary proceeded to call the roll, the following Fellows being present during the meeting:

Harrison Allen, Philadelphia, President.
G. W. Major, Montreal, Vice-President.
T. R. French, Brooklyn, Librarian.
D. B. Delavan, New York, Secretary and Treasurer.
Morris J. Asch, New York, Member of Council.
J. Solis-Cohen, Philadelphia, Member of Council.
F. Donaldson, Baltimore, Member of Council.
Beverley Robinson, New York, Member of Council.
F. H. Bosworth, New York.
S. Solis-Cohen, Philadelphia.
William H. Daly, Pittsburg.
T. A. DeBlois, Boston.
F. Donaldson, Jr., Baltimore.
J. H. Hartman, Baltimore.
U. G. Hitchcock, New York.
Edgar Holden, Newark.
F. H. Hooper, Boston.

W. C. Jarvis, New York.
S. Johnston, Baltimore.
C. H. Knight, New York.
F. I. Knight, Boston.
S. W. Langmaid, Boston.
G. M. Lefferts, New York.
J. N. Mackenzie, Baltimore.
A. W. MacCoy, Philadelphia.
E. C. Morgan, Washington.
C. C. Rice, New York.
J. O. Roe, Rochester.
C. E. Sajous, Philadelphia.
Carl Seiler, Philadelphia.
E. L. Shurly, Detroit.

Among the guests of the Association present during its proceedings may be mentioned Professor Joseph Leidy, Professor S. W. Gross, Professor S. Weir Mitchell, Dr. John H. Packard, Dr. I. Minis Hays, Dr. J. Ewing Mears, Madame Seiler, of Philadelphia, and Dr. C. C. Schuyler, of Troy, N. Y.

An address of welcome was made by Dr. S. Weir Mitchell, President of the College of Physicians.

As the formal opening of the Congress, Dr. Harrison Allen proceeded to deliver the Annual

PRESIDENT'S ADDRESS.

Fellows of the American Laryngological Association:

We are met to inaugurate the eighth annual meeting of our society. We are here to reassert the advantage obtained by convention. A good old custom is indorsed when we stamp with the social seal the results of another year's labor.

The advantage of meeting together is evident in a band of workers like our own, whose members are scattered over so large an area as is the case in America, and whose theme of common interest, until recent years, has not been appreciated as it deserves. For, not only are our triumphs new, but the dangers that attend their attainment are new also. We are enlisted in the practice of a laborious branch of medicine. Little or no routine is with us possible. No laryngologist is apt to retire from the profession as did the physician mentioned by Addison, on the ground that he was tired of guessing! The exacting nature of our studies and the sedentary character of our clinical work afford sufficient reasons why this Association should continue its good offices in giving its Fellows respite from long-continued toil.

Laryngology presents no opportunity for the superficial worker, or for him who seeks for power in the exercise of his daily duties. Our science admits of few grand occasions. No applause of the hospital amphitheatre can aid its votary, and no glamour of the surroundings of multiple assistants and invited guests can encourage and stimulate him! He must delve alone, or, at least, he must remain content to demonstrate to a few in turn the morbid appearances he is called upon to treat, and to carry on his endeavors to relieve by continuous, patient, unobtrusive effort. Yet he can claim some distinct advantage over his brethren in the general clinical field. His hours of leisure and of work are more systematically arranged; his energies are of necessity restricted to the large communities where access to libraries and to the well-equipped laboratories insures chances for study and research. Those who are desirous of indulging in scholarly diversions, those whose zest for investigation must be ever compromised with the necessity of pursuing a practical subject for support, will find, such, for instance, as a special department of medicine, in laryngology an opportunity equal, if not superior, to that afforded to the professed scientist.

Let me at this place put in a plea for the employment of leisure for science. I hear without sympathy the expression of opinion that a paper is good in the degree that it is practical. Can we not with propriety look forward to the time when every Fellow will be identified with papers based upon results gained by experiments upon the lower animals, or upon morphological data, as well as those secured from the operating chair? We will be raised in our own esteem in the degree that we add a little more science to our art.

When we consider the fact that laryngology includes in its scope the anatomy, the physiology, the pathology of the organs of speech and related parts, we have a wide area from which to select themes for study. The time, doubtless, will come when any important addition to these subjects by another than a practical laryngologist will be accepted as a reproach. The field should be occupied by its own men. To our pride it may be said that this, to a great degree, is already the case.

The work done by the physician becomes the property of all his brethren the moment it is recorded. No secret formulæ are tolerated; all is fair, generous, and above board. While this is the case, are we as careful as we should be that proper credit is given to all? Is it not too often palpable that the path the pioneer has blazed becomes in time converted into the crowded highway, while the

pioneer himself is forgotten? It is well to recall the traditions of the scientific guild in this regard—viz., to insist on a rigid application of the law of priority of discovery, to demand that improvements should be identified with the name of the investigator, and that the value of an individual's labor remain unchallenged until controverted by equally well accredited work.

For our own band, the volumes of its published transactions attest the admirable spirit which has actuated its members. It is encouraging for our reputation, and for such usefulness as we may enjoy in the future, that these volumes would do credit to any learned body in the world. The scientific spirit which actuates the Association is here evident, as it is conspicuously so in the programme before us. Without making invidious mention, it is enough to say that the treatment of nasal catarrh, of hay fever, the method of removal of morbid growths, the knowledge of the mechanism of phonation, have been revolutionized by papers contributed by yourselves. It is but fair to say that, in these subjects, no modern student can remain well informed who declines consulting our record, or be just to its literature who does not name with honor members of our Association.

And now I introduce to you the papers of the day, and wish for you a pleasant and profitable session.

Paper.

TWO CASES OF ADENOID DISEASE OF THE ROOF OF THE PHARYNX WHICH EXHIBITED UNUSUAL FEATURES.

By HARRISON ALLEN, M. D.

THE results of operation for the removal of adenoid tissue from the pharynx are so excellent, as a rule, that necessity for repeated manipulation may be said to be exceptional. It is also beyond the average expectation to have present any complication, either of the apparatus of deglutition, of oral respiration, or of any abnormal disposition of the bones which enter into the formation of the base of the skull.

In this connection the following cases are thought to be worthy of record.

Case I.—A. B., a delicate boy, aged four years and nine months, who was emaciated and of stunted growth, without appetite, and subject to frequent attacks of acute indigestion, was seen by me, at the request of

Dr. Thomas C. Yarrow, in the latter part of January, 1884. The little patient was a mouth breather. The tonsils were of large size, and the roof of the mouth was elevated in the center. The slightest attempt at depression of the tongue was followed by gagging. The nostrils were filled with mucoid discharge, while a small quantity of the same material was seen, after the act of gagging, lying at the top of the oro-pharynx. Convergent strabismus had followed upon an attack of whooping-cough.

During the day the child presented the appearance ordinarily seen in a mouth breather, but at night the respiration was greatly impeded. The phenomena attending the nocturnal phase of respiration were unusual, and will be detailed as follows:

Almost directly after the child fell asleep the respirations would become labored; after three or four inhalations, breathing would cease, the child opening the mouth and making the most strenuous efforts to inspire. A forced inspiration, which was either hoarse or stridulous in character, would ensue, when the boy would quickly fall asleep. After a moment's rest, the phenomena would reappear, in the order given, and in this manner the entire night would be spent.

To this condition, which was but little less distressing to the patient than to the parents and attendants, were added occasional fits of crying. Emesis would often ensue upon the re-establishment of regular breathing. During the attack of whooping-cough already mentioned, the symptoms became exaggerated, and were associated with irregular and tumultuous action of the heart. At that time the case was held to be one of heart disease, and was accordingly so treated by a homœopathic practitioner.

Hypertrophy of the adenoid tissue at the roof of the pharynx, associated with unusual reflex phenomena, was diagnosticated. I proposed that the boy be etherized, and the growths removed. Accordingly, on the 29th of January, the operation was performed. Fortunately the ether was well borne. The naso-pharynx was filled with a collection of villoid masses, which were attached to the roof of the pharynx. An attempt was made to break down the growths by the finger, which was inserted, for the purpose, into the naso-pharynx from the mouth; but the presence of the finger acted as a plug to the oro-pharynx and arrested respiration. Efforts were then made to rasp away the growths by the aid of a scoop, which was passed through the nose. Although this proceeding was successful, the patient in a short time showed signs of depression, and we desisted from further efforts. The roof of the pharynx was next seared with the heated platinum wire. The boy reacted well from this treatment, but to our disappointment was in no respect improved. After five weeks, during which time daily applications were made to the tonsils of a mixture of iodine and glycerin, the child was a second time (March 15, 1884) etherized, and an exploration of the throat made in order to determine, if possible, the cause of the first failure, and to remove, more thoroughly than had before been practicable, all traces of the pharyngeal growth. A few tags of the adenoid tissue were encountered, but

for all essential purposes the naso-pharynx was found empty. As it was suspected that the tonsils might be connected with the distressing symptoms, the opportunity was then embraced of excising portions of these masses. But the child was in no respect improved, if indeed he was not worse, for the days were now no longer restful. He ceased to play with his toys, and became greatly excited at any attempt at examination of the throat, while his nutrition notably failed. A third attempt was now made to detect the cause of distress, when it was definitely ascertained that the pharynx and nasal passages were everywhere patulous.

The patient was now carefully watched during the night, when we became satisfied by repeated inspection that the tongue fell back during sleep, and that the obstruction which was caused thereby was the essential condition. We then directed that the child should be taken up and held in the arms, the head being so managed that it should be placed with the face downward, while the trunk should be inclined forward. To the delight of all present, it was found that the moment this position was assumed the child sank into a profound slumber, which continued throughout the night. A system was now organized (the relations and friends of the family assisting) by which, through the whole of each night, the head of the child was so held as to keep the tongue from falling back. This plan was continued in force, without interruption, for five weeks, at the end of which time the patient was so far improved that he was able to sleep for a short time when placed upon his side. But the moment he was allowed to lie upon the back the symptoms of obstruction reappeared.

For two years the child was thus carefully watched. He was not permitted while asleep to assume the recumbent position.

The progress thus briefly indicated was not secured without many interruptions. Any depressing cause, such as an attack of indigestion, would precipitate an attack of "*lapsus linguæ*." During the year 1885 the parents passed the summer with the patient at a mountain resort, where the rate of recovery was, for the most part, steadily maintained. Yet, even under these favorable surroundings, the progress was arrested by one of the most alarming attacks of impending suffocation that had at any time occurred.

According to the last report, the child sleeps through the entire night. He prefers to lie upon his side, and, when an interruption to respiration is threatened, he will turn upon his face without waking, resting the forehead upon the hands, in which position he remains comfortable. He is now strong and bright.

Case II.—A girl, aged six years, was referred to me by Dr. Charles S. Turnbull for obstruction of the nasal passages. The child exhibited many evidences of retarded development. The cranium was small, and the sutures were prematurely united. The lower jaw was massive, receding at the mentum, but with disproportionately large angles and ascending rami. The child had been cyanotic at birth. Although the sounds of the heart were normal, the extremities were cold to the touch, and of a

bluish color. The finger-nails were marked with numerous white spots, and two attacks of whitlow had been observed.

The irritability of the pharynx was excessive, the most gentle attempts to depress the tongue invariably ending in gagging and vomiting. The nostrils were filled with mucoid discharge.

The patient had been operated on twice by other practitioners, and it was inferred that attempts had been made to remove the morbid growths which we assumed existed in the naso-pharynx. Expecting, therefore, some unusual complication which had interfered with recovery, the patient was placed under the influence of an anæsthetic (sulphuric ether) with great care, Dr. Turnbull assisting. The entire naso-pharyngeal space was found much smaller than is the rule, and barely admitted the tip of the index-finger. The roof of the space was highly arched in form, instead of the contrary, as is the rule. The posterior slope of the roof, so to speak, was the seat of an adenoid growth. This surface was on the same plane with the posterior wall of the pharynx. The growths were not villoid, as was the case with the patient first named, but were composed of broad, sub-rounded masses, whose bases were wider than any of their diameters. The finger-nail exerted no appreciable effect upon them. Finding that the masses could be reached by a straight probe passed through the nasal chambers, an attempt was made to use the galvano-cautery by way of the nose. The finger guided the electrode to the locality desired. After the current was withdrawn, the finger was a second time inserted in order to ascertain the exact effect which had been produced by the cautery before the instrument was employed to destroy a second nodule; a number of the nodules, which lay near the lower part of the naso-pharynx, were removed by curved, blunt-pointed scissors in the following manner: The index-finger of the left hand was inserted into the mouth, and placed at the free edge of the velum at the region of the uvula. The velum was then pushed up as far as was practicable, and the spot on the posterior wall of the pharynx which could be reached by the finger thus placed was determined. The scissors were next taken in the right hand, and, being guided by the left index-finger, carried with freedom to the locality of the growth, and the nodules excised by lateral movements of the blades. The patient, though not cured by the operation, was much improved. Finding that she reacted well from the anæsthetic (no evidence being presented why it could not be administered, in spite of the history of cyanosis), she was a second time etherized after an interval of a fortnight. It was ascertained by the second examination that the nodules had been entirely removed; but the membrane at the roof of the pharynx was found to be exceptionally thick, and served to obstruct the passage of air between the nose and the lower pharynx. The membrane was subjected to cauterization at several places, and the patient allowed to recover from the effects of the ether. No further efforts were made to reduce the size of the membrane by operation; but the case was treated as one of perverted nutrition of the os-

seous system and impaired circulation. Phosphate of lime and iodide of iron were administered, and the nasal chambers and the pharynx cleaned twice daily by a weak solution of carbolic acid. I saw the patient twice a week in my office for the purpose of making applications of iodine and glycerin to the tonsils. It was interesting to observe the gradual improvement which took place in the nasal respiration, and the steady restoration of the child to a condition reasonably like that which is expected at six years of age. The child at the present date appears to be entirely recovered.

Remarks.—The *first case* may be named an instance of paresis of the suspensory apparatus of the hyoid bone and the tongue, the paresis occurring by coincidence in a child who was the subject of the symptoms which are associated with the presence of adenoid growths in the pharynx.

Three subjects for reflection present themselves in connection with this interesting case:

First, that the tonsils were perhaps the cause of the whole trouble, and, if they had been excised early, the subsequent troubles would have been prevented. This, while a plausible argument, is, in my judgment, inconclusive. It was seen that the obstruction in the throat was most marked when the patient was sleeping, namely, at a time when the muscles of the throat were relaxed, and when the tonsils were enabled to fall laterally to the utmost. This change in the position of the enlarged tonsils is comparable to the appearance of the same bodies when hypertrophied, and seen when the patient is under the influence of ether. Tonsils which in the normal state of tonicity of the pharynx are pressed against each other are, under ether, scarcely visible. I think we are all cognizant of cases in which the tonsils are of great size, yet no symptoms follow so long as the naso-pharynx remains free from adenoid hypertrophy.

Second, that the distress was entirely due to the presence of the adenoid hypertrophy. This was the position taken by Dr. Yarrow and myself, and, as we have seen, an erroneous prognosis was made. It was the first instance which had occurred to the writer in which the ablation of the adenoid masses did not entirely remove all difficulty in respiration.

Third, the persistence of the symptoms of obstruction until they were controlled by mechanical means. It is likely that the paresis of the suspensory apparatus was intensified by the attack of whooping-cough; but of this fact the clinical history is not conclusive.

The chief point of interest in the *second case* relates to the shape

of the naso-pharynx. The space was compressed from before backward, the basilar process of the occipital bone being joined to the body of the sphenoid bone, to form a narrow, high arch to the pharyngeal vault. An abnormal disposition of the parts which entered into the conformation of the base of the skull thus became a conspicuous clinical feature. The diseased structures were confined to the basilar process. Associated with the adenoid growth was a thickening of the mucous membrane, which caused in itself arrest of nasal respiration.

The impaired state of the circulation, the recognized failure in the normal directions of nutrition, were sufficiently marked to warrant the precautions taken when rudely disturbing the structures lying at the roof of the pharynx. When we recall the intimate relations which exist between the roof of the pharynx and the base of the brain, it becomes a matter of congratulation and surprise that the open spaces known to be present in the base of the skull, and which are held to be the vestigial tracts of early communication between the throat and the brain, do not frequently appear as factors in the clinical studies of this portion of the body.

Discussion.

Dr. Hooper said: "I have seen a case of severe chorea supervene after the removal of adenoid vegetations and upon the sudden restoration of hearing. This is the only unusual feature I have ever seen that can be considered due, even remotely, to the removal of these growths. The patient was a little girl, eight years of age, very precocious, and of marked neurotic tendencies. Nasal respiration had been obstructed and her articulation defective since the age of three. She began to grow deaf about a year ago. The deafness increasing and becoming very marked, she was referred by her family physician, Dr. Fuller, of Charlestown, to Dr. C. J. Blake. Dr. Blake found evidence of adenoid vegetations, and placed the child in my care. It was deemed necessary to administer ether, and a very large quantity of adenoid tissue was removed, followed by immediate improvement in the breathing and articulation. The operation was on February 7th. Four days after, Dr. Blake saw the child, and a single inflation of the middle ears, by means of the Politzer air-douche used very gently, resulted in an immediate and very marked improvement in the hearing. The air-douche had been used before the removal of the vegetations, with no apparent effect. But now there was an entire change and complete restoration of hearing. The child's delight was extreme; she talked incessantly, and kept asking if she could always hear so well. From this time she began to grow nervous and uneasy. On February 19th—that is, eight days after the restoration of hearing—while taking

a violin lesson, she told her teacher that she could not keep still; she tried, but was conscious of some power at work on her movements By March 1st symptoms of undoubted chorea began to develop. She had little control over her movements, acted strangely, her speech was thick and childish, and she was very irritable. On March 16th she had several severe convulsions, acting like a maniac. From March 17th to May 5th she was speechless, and the victim of the severest form of chorea. She could be kept in the bed only by constant watchfulness, her arms, legs, and head being in incessant and violent motion. Swallowing was performed with great difficulty. Various remedies failed to procure sleep. Dr. Fuller, who had charge of the case, called Dr. Abbot in consultation at a critical moment, when it seemed as if the unceasing muscular action could not go on much longer without fatal exhaustion, especially as the child had only slept four hours out of the last forty-eight. Dr. Abbot advised the use of urethane, which induced a quiet and natural sleep. This happened on April 23d, and from that day she began to improve. All choreic movements have now ceased, and she is gaining rapidly. Dr. Blake said that it was evident, from the readiness and ease with which the air entered the middle ears, that the same improvement in the hearing might have been effected spontaneously at any moment by a fit of coughing or sneezing, the result being a restoration of the mobility of the sound-transmitting structures of the middle ear and a consequent influx of sound to and excitation of the sensory centers sufficient to account for the awakening of the choreic symptoms in a subject so predisposed."

Dr. Shurly, referring to the anæsthetic employed during the use of the galvano-cautery, said that he had always been in the habit of using chloroform. He had understood that there was danger of ignition of the vapor of ether.

Dr. Langmaid said that, in the first case reported, difficulty of respiration had been referred to. He had not had an exactly similar experience, but could recall one which he had mentioned in a discussion upon a paper by Dr. Hooper, read before the Boston Society for Medical Observation a few weeks ago. It was the case of a boy with a large adenoma in the pharynx. This growth was removed, and the hearing was perfectly restored. One morning he entered his office and found the mother and child both there; the boy was asleep on a sofa. Any difficulty in diagnosis was relieved by his office boy, who assured the mother that the difficulty in the boy's breathing was caused by a tumor behind his palate. While he slept, a marked interval was noticed between his inspirations, which were remarkably slow. It was an odd coincidence that the boy had to get on his hands and knees in his efforts for breath; either because relief was afforded in this posture by the falling forward of the tongue, or because of some alteration in the inhibitory center. The removal of the growth relieved all the symptoms.

Dr. C. Seiler said that the effect upon the voice of the removal

of even small growths was sometimes remarkable. Dr. Bosworth had recently referred to this in a paper read in New York. He said that the effect that pharyngeal growths exerted upon the higher notes was so marked that lines might be drawn upon the posterior wall of the pharynx on which notes might be placed like a music staff. He had recently seen a case illustrating this. It was that of a young girl who, in singing, found that she was losing the higher notes. He scraped off some adenoid vegetations from the roof of the pharynx, and the patient came back the next day and said that all her notes had been restored. She could now reach the high notes with ease.

The PRESIDENT, in closing the discussion, said that the discussion had been very interesting to him. Dr. Hooper's case showed the effects of the removal of an adenoid growth upon the entire system; in his own cases, the symptoms appeared before the growth was removed. With regard to the danger of ether, he thought that it might be entirely prevented if, before applying the galvano-cautery, the patient was fanned vigorously so as to dilute the ether vapor with air until it was no longer inflammable. He never had had any such difficulty, and never used anything but ether. He was afraid of chloroform on account of its effects upon the heart; ether was much safer. Dr. Langmaid's case raised the question of priority, although he thought that the two cases were not identical. Dr. Seiler's case was an interesting one. It recalled to his mind the case of a young lady who had no difficulty in breathing whatever, but had difficulty in singing the higher notes. He removed a small growth, and the patient's power to reach the upper notes returned. She stated, however, that she experienced the sensation of having a large cavity in the upper part of her pharynx. It appeared as if there might be something of a neurotic element in this case.

Dr. F. I. KNIGHT interrupted Dr. Allen to say that he presumed the remarks in regard to priority of observation of the interruption or suspension of respiration during sleep were intended to apply to cases of adenoid hypertrophy only, as such suspension of respiration was a matter of common observation in hypertrophy of the tonsils.

Paper.

A CONTRIBUTION TO THE STUDY OF LUPUS OF THE THROAT.

BY RAMON DE LA SOTA Y LASTRA, M. D.

GENTLEMEN: I beg leave to submit to your consideration the result of my observations upon a disease the diagnosis of which is not always easy. Although I have studied manifestations of lupus in the throat with the greatest care, I have sometimes failed to recognize the lesion. The latest instance of this kind occurred to me in the summer of 1884, when my friend M. Pizarro, M. D., pro-

fessor of hygiene at the medical college in Seville, came, accompanied by his own physician, to consult me about an affection of his throat. I had vaguely heard before some of my fellow-professors say that Dr. Pizarro was seriously ill, and, therefore, I was not in the least astonished to find him very much emaciated, reduced in strength, extremely gloomy, and with a clayey complexion.

He informed me that he had commenced to suffer with his throat about one year before, and that during that period he had been unable to feed himself except with milk and broth, as the swallowing of any solid food gave him a good deal of pain.

On examining his mouth, I found his tongue covered with psoriasic scales; the palatal mucous membrane tumefied, lumpy, and of a wine-red color; the right arch, tonsil, and pillars being ulcerated, the ulcer extending inferiorly to the pyriform fossa and superiorly to the middle of the uvula, and involving one half of the structure, anteriorly to within half an inch of the palatal border, and penetrating into the submucous tissue. Its borders were red and swollen; its surface was nodular, irregular, and of a hard, elastic consistence. There was some pain upon palpation, but bleeding was not occasioned. The patient felt no trouble whatever, either in talking, or while coughing, or swallowing any liquid.

The pharyngeal mucous membrane was injected, bluish, and covered by granulations, the larynx being in its normal state with the exception of the right aryteno-epiglottic fold and the corresponding part of the inferior border of the epiglottis, which were somewhat tumefied and reddened.

The patient's voice had its normal sound and ring, and breathing took place with perfect freedom. The submaxillary glands were somewhat swollen. In his morbid history nothing of a syphilitic character could be found, nor any other malady worth mentioning, save slight manifestations of the rheumatic diathesis.

Taking into consideration these antecedents, the lingual psoriasis, the peculiar features of the affection of the throat, and that my fellow-professor was in the sixtieth year of his age, I believed that I had to deal with an ulcerated epithelioma. I expressed this belief to the physician in charge, who agreed with me both in the prognosis and as to the treatment. Nevertheless, mistrusting the information supplied by our friend, and wishing to find something to modify our judgment as to the nature of the disease, in which we could not thoroughly discover some of the symptoms of epithelioma, we resolved to apply an anti-syphilitic medication, watching its effects most carefully. Immediately after, on consultation, Dr. Pizarro commenced to take Gibert's "syrupus deuto-iodureti hydrargyri," at the same time gargling frequently with a solution of potassium chlorate. This medication produced such very prompt and bad results that it became necessary to suspend it immediately and to substitute compounds of iron, bitter tonics, and such restorative diet as the want of

digestive strength and the difficulty in swallowing solid food would allow. When the organism became somewhat restored the specific treatment for syphilis was resumed; but the lesion at the palate extended so very much and took on so bad an aspect in a few days that we were compelled to give up the specific treatment, and thus we became more positive than at first in the idea we had formed of the disease.

The physician in immediate attendance upon Dr. Pizarro had to leave the city at this time, and I was then compelled to take entire charge of the patient. As it astonished me to find that this great ulcer did not produce lancinating pain, that it never bled, and that it never acquired a greater hardness now and then, I had some doubts on the subject, although I remained under the impression of having to deal with an epithelioma. From the moment I took charge of the patient I prescribed a potion containing sodium arseniate, to be taken in gradually progressive doses; gargles with a solution of resorcin; and powdered iodoform, to be applied to the ulcer after having it washed with a solution of borax. For a month the ulcer continued to extend in periphery and in depth until it had destroyed more than one half of the uvula, a great part of the soft palate, and the amygdalæ, as well as a portion of the pharynx.

When I had lost all hope, the ulcer suddenly stopped its progress, and became covered by healthy-looking granulations of good consistence; cicatrization commenced to take place, and was finally completed in three months, some irregular scars remaining, depressed in some places, prominent in others, partly discolored at intervals, red at others, soft here and hard there, the posterior being adherent to the pharyngeal wall. The lingual psoriasis still kept on. Deglutition became normal again, and my patient's restoration to health took place in a short period. It is now more than a year and a half since the occurrences narrated, and Dr. Pizarro's cure still holds good.

Reflecting upon all these facts, I became aware that my friend's disease had been a lupus, whose evolution I had witnessed without suspecting it even a single moment. But, as there is nothing to occupy the mind of a practitioner more important than an error of diagnosis, I have availed myself ever since of all the opportunities presenting to determine with the greatest possible accuracy those characters which made me doubt about the epitheliomatous nature of Dr. Pizarro's illness. I am now going to state, in the shortest possible way, what my observations and experience have taught me about lupus of the throat.

This disease makes its appearance at any period of life; as I have seen it in adults oftener than in children, I can not agree with Hebra in its being a disease peculiar to childhood. I have observed it oftener in men than in women, and, although it is to be met with in every constitution, the greatest number of those attacked who

have come under my care were of a lymphatic temperament. A good many of them had suffered from scrofula, others from syphilis, a few from herpes, and some of them, like Dr. Pizarro, had been and were still subject to rheumatic manifestations. Exception made of the diathetic states just mentioned, I have been unable to ascertain anything with regard to its inheritance. If the men whom I have treated were smokers, I do not dare to attribute to tobacco any part in the causation of the disease, as there are but very few men in Spain who do not smoke. Neither have I found that hard drinkers were more liable to suffer from lupus, as I have seen very many cases in persons who would not even drink a small quantity of wine at table. I have never been able to discover that great efforts of voice, habitual exposure to an atmosphere overloaded with irritating substances, cauterization of the mucous membrane of the throat, the influence of heat or cold, or any local agencies whatever, are to be considered as especially prone to produce this disease.

I have never had the opportunity of observing the initial manifestations of lupus in the throat, but I have been able to detect the first steps in the invasion of the sound places attacked by the lupus later in the disease.

Sometimes the mucous membrane assumes a purplish color, swells up, and becomes granular, and one or two of the granulations develop so much as to reach the size of a pea, or even that of a hazel-nut. Occasionally the tubercles become prominent in the throat previous to alteration in the mucous membrane, and without differing from its normal color. They may either remain superficial, as if they were hypertrophic papillæ, or they may attack all the mucous tissues, and even penetrate down to the submucous connective tissue. Their form is rounded, the tubercle being either hemispherical, oval, flat, or conical. Their surface is smooth and brilliant, but, if several of them become intimately united, they appear as a single mass, rounded, cloven, and anfractuous. The lupous tubercle can be distinguished by its very red color from the leprous tubercle, which is opaque and of a turbid white. It is very seldom that a single tumor is observed in lupus, as is the case in carcinoma.

Generally there are several of them, either scattered or grouped, but always quite distinct. I have seen them simultaneously in the wall and in the wing of the nose, in the tongue, in the palate, and in the ventricular bands. On pressing them they present a sort of elastic resistance, which can be better felt than explained. This hardness is greater than that of inflammatory infiltrations, but it

never reaches the consistenc eof the epitheliomatous tumor. Those parts on which the tubercles develop become rigid, for which reason their natural movements are sluggish, restrained, or entirely lost. Therefore the tongue can not conduct the food for its convenient mastication; the palate does not succeed in closing the naso-pharyngeal space during deglutition, nor does it assume a proper position for articulation; the epiglottis allows the food to get into the larynx, and the vocal cords do not vibrate sufficiently. When the tubercles develop exuberantly in the larynx, breathing becomes embarrassed and may become stridulous. Even apnœa may result. Contrary to what happens in carcinoma and in leprosy, which almost always produce, the one lancinating pains, the other a more or less complete anæsthesia, there is no alteration whatever in the sensitiveness of the parts affected with lupus. After a shorter or longer period the tubercles soften and become ulcerated. This melting down does not take place in a complete manner. In some cases only the surface of the tumor becomes fissured or excavated as a margin to simple excoriations. In others the destructive process attacks a greater or smaller portion of the tubercle in its entire depth, producing ulcers which dip out of sight in the midst of the tissues. In the former cases the affected mucous membrane appears denuded, red, smooth, purple, and granular. It is painful upon palpation. It does not bleed either upon pressure or spontaneously.

The cure is difficult and is always followed by indelible scars. In the latter instances the ulcers appear either under the aspect of deep crevices, with raised, rounded, red, hard, and perpendicularly cut borders with a narrow and smooth bed; or as heavy losses of substance which affect all the thickness of the tissues, and whose ravages neither aponeurosis, cartilage, nor bone can check; their borders are prominent, congested, and elastic, and their bed is granular, uneven, bright red, sensible to pressure, never hæmorrhagic, and always covered with a sanious and purulent secretion. This indolence and want of hæmorrhage are never found in carcinoma, nor are they observed in tuberculosis.

In some cases the ulcers are developed in a slow but fatal manner, in others they spread with astonishing rapidity, while in some others they stop in the beginning, but how far their ravages may reach it is impossible to predict. I have found them superficial and of the size of a lentil after having existed for a long time. I have seen them develop in a few days, occasioning horrible mutilations. I have observed them remain apparently perfectly quiescent during

months and even years, and then suddenly and without any perceptible cause take on such destructive activity that their ravages have been quite frightful. I have watched them progressing continuously, in spite of the greatest care, to stop short at the most unexpected moment. When the healing of an ulcer is complete there remains an irregular scar, raised in some places, depressed in others; red in the former and white in the latter instance; a very retractible scar, which produces great deformities. Lupous scars differ from those originating from syphilitic ulcers in that these latter are white, radiated, and depressed. Sometimes there are preternatural adhesions of the arches to the posterior pharyngeal wall, of the uvula to the arches, of the pillars to the back of the tongue, of the cheeks to the gums. The aryteno-epiglottic folds, the ventricular bands, and the vocal cords may unite together in a greater or less extent, producing alteration of voice or aphonia, difficulty of respiration, or its complete obstruction. Cicatrization always takes place slowly, stops without any apparent reason, or is easily destroyed.

Besides the scars there remain infiltrations which determine the enlargement of the part, the corresponding mucous membrane keeps purple, bright, granular, and dry, generally with more or less desquamation of epithelial scales without any resulting excoriations.

Nevertheless, the submucosa appears uncovered occasionally, and some patients have come to me quite frightened at feeling the pain produced by the contact of the papillæ with some exciting substance, believing in consequence of it that there was about to be a repetition of their former sufferings. But, fortunately, up to the present moment I have never seen such an unpleasant result. All practitioners agree in one thing—viz., that lupus in the mucous membranes is by far more difficult to heal than the same process in the skin. This I am quite ready to acknowledge, but, without boasting about originality, I must state that in many cases I have found quite efficacious the treatment that I apply to that terrible disease, no matter whether the lupus resides on the external or on the internal integuments.

I do not despise nor condemn, as do German writers, internal medication. I prescribe iron and cod-liver oil to scrofulous patients, mercurials and iodine compounds to syphilitic ones, arsenical preparations to the herpetic, alkaline solutions to the rheumatic, and bitter tonics and invigorating medicines to those whose constitution has been impaired by any previous disease, by overwork, or by insufficiency of nourishment.

It seems to me that this general treatment has an active influence

on the success of topical medication, from which we can not part, as through it we obtain undeniable success. When the lupus is not ulcerated I apply a caustic substance. Until a few months ago I have used the *tinctura iodi*, but, having obtained wonderful and rapid cures with lactic acid in the cutaneous lupus, *exedens et non exedens*, I have not hesitated to apply it to the mucous membrane of the nose, of the lips, of the cheeks, of the tongue, of the gullet, and even that of the larynx; and I can assert that I have met with no other inconvenience but the natural pain, the intensity of which has been as varied as the number of patients I have observed.

In ulcerated lupus also I sometimes make applications of the lactic acid, but more frequently I wash the affected region with a solution of borax, covering it afterward with powdered iodoform. I always prescribe gargles with a solution of resorcin (one per centum), and my patients are submitted to the strictest hygienic *régime*.

All patients who have submitted themselves to this treatment have recovered in a longer or shorter period; but I must confess my belief that, in some instances, the cure has been realized rather in the natural evolution of the disease than by virtue of therapeutic measures.

Paper.

REMARKS ON SOME POINTS CONNECTED WITH THE ANATOMY OF THE LARYNX.

By JOSEPH LEIDY, M. D., LL. D.

[THE author made the following verbal communication on some points in the anatomy of the larynx. He premised that he appeared before the association by invitation of the Council. He had no elaborate paper to present, but, as he had at various times in conversation with the president, Dr. Allen, expressed some views rather different from those generally held in regard to the anatomy of the larynx, he had been invited to repeat them, and had consented to do so, in the hope that they might prove of some interest to the association.]

In the first place, in reference to the aperture of the larynx, its lower extremity is formed by the notch of the arytenoids, bounded laterally by a pair of mammillary eminences, of which the lower two compare with the corniculate cartilages (cartilages of Santorini). Those immediately above are usually ascribed to the presence of two little cartilages, the cuneiform cartilages (cartilages of Wrisberg), lying parallel with and just above the corniculate cartilages.

These eminences invariably conform to a group of glands, but the cuneiform cartilages are, in our people according to my experience, oftener absent than present, or, at most, scarcely developed, while they are commonly conspicuously produced in the negro, in which they are often a quarter of an inch in length, as in an example exhibited.

A second point of interest relates to the so-called vocal cords, which are usually described as a pair of elastic ligaments extending from the entering angle of the thyroid cartilage to the prolonged inner angle, or vocal process of the base of the arytenoid cartilages. From their connections they are named the thyro-arytenoid ligaments, or, in contradistinction to the less distinct so-called false vocal cords, the inferior arytenoid ligaments. Physiologically, it may be correct to speak of vocal cords, but anatomically they do not exist as distinct organs. They are nothing but the upper somewhat thickened border of a membrane, correctly named from its attachments the crico-thyro-arytenoid membrane. The thickest portion of this occupies a median position in front of the larynx connecting the cricoid with the entering angle of the thyroid cartilage. Thence it extends along the upper border of the cricoid cartilage on each side to the vocal process of the arytenoid cartilage, and is separated laterally from the thyroid cartilage by the intervention of the lateral crico-arytenoid and thyro-arytenoid muscles. Commonly a narrow band forming the upper border of this crico-thyro-arytenoid membrane is artificially separated from the rest and regarded as the vocal cord, and the crico-thyroid ligament is described as being attached along or continuously with the latter. Properly the crico-thyro-arytenoid membrane would be the vocal membrane the upper border of which bounds the glottis and vibrates in the production of sound, as the edge of a door vibrates when the wind whistles through the crevices.

The appropriate muscles which modify the condition of the vocal membrane through its attachment to the movable arytenoid cartilages are the arytenoid, the posterior and lateral crico-arytenoid, and the thyro-arytenoid muscles. These are all supplied by the same nerve, while the crico-thyroid muscles, which are not so closely related with the condition of the vocal membrane, are supplied by another nerve. The other muscles ascribed to the larynx, such as the aryteno-and thyro-epiglottic muscles, are very variable, frequently feebly produced, and of comparatively little importance.

Intermediate to their points of origin and insertion the arytenoid and crico-arytenoid muscles lie in contact with the subjacent surfaces,

attached by loose connective tissue; but the thyro-arytenoid muscle partially arises from the subjacent surface of the vocal membrane.

In conclusion, I do not profess to have made a discovery, but simply intend to express my views, in a measure different from those commonly taught, but perhaps already known to the members of the association.

[Preparations illustrating the points above mentioned were exhibited.]

Discussion.

Dr. J. Solis-Cohen.—Several points of interest have been brought out by the lecturer. The first one is with regard to the cuneiform cartilages, which are said to be so seldom developed in the white, and so largely developed in the colored race. I have often seen them largely developed in whites. In a case to be exhibited at this session for another purpose they are so large that they extend completely across the ventricular bands, projecting beyond them so as to present the aspect of a little tumor. I have noticed that those persons who have the cuneiform cartilages best developed usually have the most control over the voice; possibly because it gives additional room for muscular attachment. The cartilage seems to keep the ventricular band on the stretch, as the ribs keep the cover of an umbrella distended. The second point noticed, with regard to continousness of the vocal band with the crico-thyroid membrane, is of great interest. It furnishes a clew for differentiation between paralyses of the thyro-arytenoid and of the crico-thyroid muscles which present the same picture—the Indian-bow paralysis of the Germans. The diagnosis may be easily made by placing a finger upon the crico-thyroid membrane in front; if the membrane vibrates with the voice, then the case is not one of crico-thyroid paralysis. When the Professor was speaking of voice and the action of the crico-thyroid muscle, he spoke of this muscle pulling down the thyroid cartilage. This the speaker surely did not mean, for, when this muscle contracts, the thyroid does not descend, but the cricoid is elevated. I am glad to hear the explanation given of the relations of the muscles to the crico-arytenoid joint. Owing to their peculiar attachment, the posterior crico-arytenoid muscles not only separate the vocal bands so as to enlarge the glottis, but they increase the tension of the vocal bands by drawing the cartilages backward. If the vocal bands are made tense by the contraction of all the muscles which bring them together—the lateral crico-arytenoids, the crico-thyroids, and the arytenoids—then the posterior crico-arytenoids will help in maintaining the tension of the vocal bands.

Dr. F. I. Knight.—I would like to ask Dr. Cohen whether the means of diagnosis which he mentioned is based on experience or not. Has he ever seen a case of isolated paralysis of the crico-thyroid muscle?

Dr. Cohen.—I have seen a case which I thought was one of paralysis of that muscle.

Dr. Knight.—Dr. Leidy's demonstration of the extent of the attachment of the crico-thyroid membrane, and its identity with the vocal bands, explains the serious impairment of the voice following the old operation of laryngotomy for the removal of growths, in which a long incision was made from the hyoid bone down to the trachea. It is well known clinically that, when the cricoid cartilage is spared, the chances of a good voice after the operation are very much improved.

Dr. F. H. Hooper.—I have been much interested in the remarks relating to the cartilages of Wrisberg, which recall to my mind a case recently seen at the Boston City Hospital. The patient was an Irishman, about fifty years of age; he had an enormous development of these bodies. His larynx resembled the larynx of a dog. In the dog there is a muscle attached to these cartilages which corresponds, I suppose, to the *dilatator vestibuli laryngis* in man. If this muscle in the dog is stimulated, the cartilage is rotated outward, in the same manner as the arytenoid cartilage is by the contraction of the posterior crico-arytenoid muscle.

Dr. Leidy.—I am pleased to hear the explanation, and I regard it as a very satisfactory one.

The President.—The most interesting point to me is that so small a portion of the surface of the cartilages serves as the origin for the laryngeal muscles; however, this, after all, is only like what is found in other parts of the body. The most delicate muscles everywhere are those which have the least amount of origin and insertion, while large muscles have large surfaces of attachment. In the eye, for instance, the muscles have very well-defined points of origin and insertion.

PRESENTATION OF INSTRUMENTS.

Dr. John N. Mackenzie, of Baltimore, presented an Instrument of Original Design for fracturing the Nasal Septum.

The main objection to the instruments in general use for this purpose is, that they make a very imperfect impression upon the septum; there is not a sufficient amount of leverage in the handles to drive the blades through the cartilage. In the instrument of Dr. Mackenzie the handles are long and heavy, so as to give more power. It will cut through six thicknesses of chamois leather.

Dr. Carl Seiler, of Philadelphia, exhibited a Section Cutter for making Sections of the Entire Head.

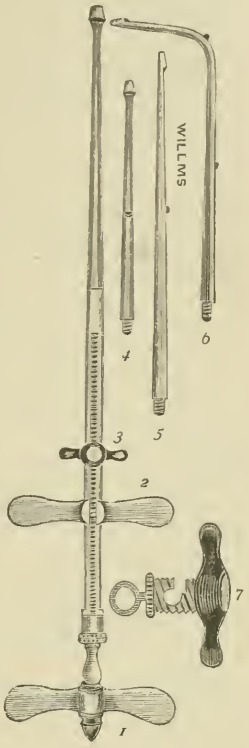
Dr. Seiler said that he had been engaged for some time in topographical studies of the upper air-passages, and had constructed the apparatus exhibited for the purpose of making sections of frozen heads. It was shaped like a "miter-box," the head being clamped in position and sections made with a common hand-saw. It takes about four hours to freeze a head in a mixture of ice and salt; the sections are readily made. Specimens of various sections of the human head were also exhibited. He had also made some experiments in making permanent preparations

by electro-plating the specimens. He thought that they might be afterward exposed to heat, so as to char the organic matter, which might be removed, and the internal cavity might then be filled with wax.

Dr. J. H. Hartman, of Baltimore, exhibited an ÉCRASEUR FOR THE REMOVAL OF NASAL AND NASO-PHARYNGEAL GROWTHS.

The advantages claimed for the instrument were as follows:

The method of fixing and attaching the wire, which is firmly held by means of the slot in the screw attachment (Fig. 7), the method of its action rendering slipping of the wire impossible. The easy movement and power exerted by the rotator (Fig. 1), and the different forms and sizes of attachments (Figs. 4, 5, and 6), which can be readily adjusted to meet various cases. No particular size of wire is required. Any size can be used as the necessities of the operation may demand.



NEW GALVANO-CAUTERY INSTRUMENT.

Dr. C. E. Sajous, of Philadelphia, presented a handle for galvano-cautery purposes with a device for facilitating the attachment of the cords; the ends of the rheophores are introduced into a cavity, and fastened by a turn of the screw in the end. Another point is that the cords are attached in the middle of the handle, and are therefore more out of the way than when introduced into its extremity. The conductors in the handles are of copper, which offers less resistance to the current than the usual form.

Business Meeting.

At the conclusion of the scientific proceedings the association went into executive session.

The President appointed the following:

Nominating Committee.—Dr. FRENCH, Dr. F. I. KNIGHT, and Dr. MAJOR.

Auditing Committee.—Dr. SHURLY, Dr. HOOPER, and Dr. SAJOUS.

The President ruled: That the amendments of last year, relating to the election of active Fellows, shall not affect the proceedings

at this meeting, but that the election of active Fellows and all subjects connected therewith shall be governed by the former custom under the old constitution.

The Secretary explained that the amendments were of the by-laws, and conflicted with a clause in the constitution, and that they were, moreover, indefinite in phraseology. Therefore the Council had advised the association to proceed as in former years, and thus avoid confusion.

The Secretary read the report of the Council upon this question, and, a ballot having been taken, the following gentlemen, upon the nomination of the Council, were unanimously elected active Fellows of the association:

Benjamin F. Westbrook, M. D., Brooklyn.

Frank Donaldson, Jr., M. D., Baltimore.

J. C. Mulhall, M. D., St. Louis.

Alexander W. MacCoy, M. D., Philadelphia.

Dr. Shurly moved: That the regular order of the programme as arranged be carried out, and that unanimous consent be required for any deviation from the same, and that any member, being absent or unprepared when his time comes, shall thereby forfeit his place on the programme.

Dr. Hartman moved to amend by omitting all the words following "deviation from the same."

The amendment was accepted, and the motion as amended was adopted.

Adjourned.

First Day—Afternoon Session.

Paper.

CONCERNING THE POSITIONS OF PARALYZED VOCAL BANDS.

(FROM STUDIES MADE IN THE PHYSIOLOGICAL LABORATORY, HARVARD MEDICAL SCHOOL.)

By FRANKLIN H. HOOPER, M. D.

IT is the purpose of this paper to inquire into certain influences which may combine to determine the positions of paralyzed vocal bands, and to ask whether we are always justified in assuming that a given position of an immobile vocal band is indicative of the arrested function of this or that muscle of the intrinsic laryngeal group. In other words, are there not some anatomical factors besides

the arrest of what we suppose to be the action of a laryngeal muscle, as well as certain physical causes, which may contribute toward producing the position in which a paralyzed vocal band may happen to be when we see it reflected in the laryngeal mirror? For instance, supposing we could take one hundred individuals of different age, size, and sex, and in each of them cut one or both of the recurrent laryngeal nerves, should we find the vocal bands in all of them occupying the same, or relatively the same, position? Undoubtedly we should not, and for the reason that there are other factors besides the arrest of the nerve-supply which are not without their importance in influencing the different shapes and positions of paralyzed vocal bands. The shape of the glottis should be taken into consideration, whether it is large or small, round or oblong. Peculiarities in the external form of the thyroid cartilage should also be noted. The elasticity of the soft parts of the larynx, the degree to which the arytenoid cartilages are developed, and the possible presence of anomalous bundles of muscular fibers which one not infrequently meets with in dissecting larynges, should be borne in mind. The strength and the development of the intrinsic muscles themselves, especially of the arytenoideus transversus, should not be lost sight of. Finally, as we know that the vocal bands move through a wonderfully complex and co-ordinated action of many muscles, it is still an open question what effect a paralysis of any one of them, the functions of the others remaining unimpaired, would have upon the position and shape of the vocal band.

It has often been experimentally demonstrated that after section of both recurrent laryngeal nerves new-born animals soon die from asphyxiation consequent upon closure of the glottis. Old, and especially large, animals do not die after the same operation, because the glottis remains sufficiently open to permit the passage of air. The reason of this is obvious. During the inspiratory act there is a constant movement of the air down the larynx to the lungs. This movement, naturally, is the same at all stages of life; but the larynx differs greatly according to the age of the animal. In the young it is small and elastic, and the cartilages are soft and slightly developed. If at this period of life the nerves going to it are cut, its delicate walls, being no longer held in position, close during inspiration with a valve-like action, thus preventing the entrance of air and producing death by asphyxia. This is not the case in advanced years, when the larynx has become spacious, its cartilaginous portions hard, and at times even ossified, and when the soft parts have lost much of

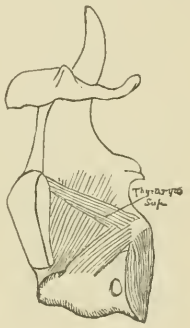
their elasticity. Quiet respiration progresses under these conditions after the recurrents are cut as well as before. The positions of the vocal bands are altered, it is true, but sufficient space remains between them for the ingress of air.

If atmospheric pressure produces such an effect as this upon the glottis and larynx after section of both recurrents, we must admit that when one of those nerves is paralyzed the half of the larynx supplied by it may be influenced in some way by this same force acting upon its motionless parts. The section of one of the recurrent nerves in kittens is followed by marked laryngeal dyspnœa. We have seen the larynx of a full-grown cat instantly close after both recurrents had been cut, and she succumbed asphyxiated in three minutes. This is not the case, however, with all adult animals. We remember an enormous dog, old and decrepit, that, after both of the recurrents had been divided, showed very slight change in the positions of the vocal bands from their normal state, and, as far as the respiratory function of the larynx was concerned, the dog could have lived indefinitely.

In cases of unilateral paralysis of a vocal band we not infrequently see that the immobile band looks shorter than its fellow. Sometimes it is slightly bowed, half-moon shaped; at other times not. Again, the ary-epiglottic fold of the affected side, especially the cartilage of Santorini and the parts immediately about it, appears to stand forward and in advance of the arytenoid cartilage of the healthy side. It has occurred to us that gravity may be a factor in causing these appearances. One half of the larynx being no longer stimulated by nerve-currents, the posterior flexible parts fall slightly forward under the influence of gravity; the bowing and apparent shortening of the vocal band are due to the tilting forward and downward of the arytenoid cartilage. We have not yet had an opportunity of testing this hypothesis by experiment. It may be urged that if this is true we should invariably have the same picture in all cases of recurrent paralysis. But, whatever the explanation may be, we do not. We know, from our own experiments on dogs and cats of different age and size, that, after section of one recurrent nerve, the vocal band does not invariably assume the same position. In the great majority of cases the paralyzed vocal band remains in the intermediate, the so-called "cadaveric," position, but sometimes it is motionless nearly in the median line; again, it may be tense, its free edge sharply defined, or it may be apparently curved, an appearance caused, perhaps, in part, by a prominent vocal process, or an

unusually large amount of yellow elastic tissue in that region. The appearance of the arytenoid cartilage and ary-epiglottic fold of the affected side standing in front of that of the opposite side has not been observed as yet in any of our experiments on the lower animals. This forward position of the arytenoid cartilage and of the parts surmounting it is not seen in every case of unilateral paralysis of the larynx, and it may depend upon the nerve-supply, which differs in different individuals, or upon the seat of the cause of the paralysis, or perhaps upon some anomaly of the distribution of the muscular fibers of the ary-epiglottic fold. Bundles of muscular fibers are not infrequently found in this region, running this way or that, which we take to be the stylo-laryngeus and the thyro-arytenoideus superior of Luschka, and which, probably, have no particular office unless it be to strengthen the ary-epiglottic fold.

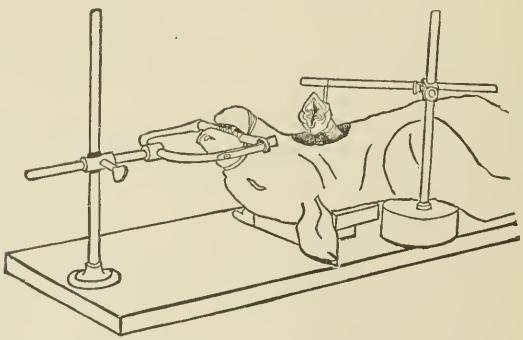
If one will look at this drawing, made by Dr. H. P. Quincy from a recent dissection of a human larynx in which the thyro-arytenoidei superiores muscles were very well developed, we think it will appear plain how this muscle, when present, may alter the position of the arytenoid cartilage. Running as it does from the inner superior surface of the thyroid cartilage on to the arytenoid, and being innervated from other sources besides the recurrent, it may, by its action, pull the arytenoid forward. The same may be said of the ary-epiglottic and the ary-membranosus muscles, both of which are subject to considerable variation. The oblique bundles of fibers composing the constrictores vestibuli laryngis muscles, we have also noticed, as pointed out by Luschka, vary greatly in size, and may even be much less developed on one side of the larynx than on the other.



Leaving now this more or less speculative ground, let us turn to the arytenoideus transversus muscle and consider how it may influence the position of the vocal band in relation to the median line of the glottis. In order to have a clear conception of the function of this muscle, the peculiarities of the parts upon which it exerts its influence should be borne in mind. The crico-arytenoid articulation is unique. Where do we find in the body another joint that permits such a variety of movements? The articular facet of the cricoid cartilage is convex, that of the arytenoid concave. The facet of the cricoid cartilage, elliptical in outline, has a surface very nearly cy-

lindrical, the axis of the cylinder being directed forward, outward, and downward. The longest diameter of the elongated convex facet of the cricoid cartilage being almost at a right angle to the longest diameter of the concave facet of the arytenoid cartilage, an extensive sliding movement of the latter cartilage on the cricoid is made possible. The movements of the arytenoid cartilage upon the cricoid appear to be either a rotation around the axis of the cylinder above described, or a sliding movement in the direction of the axis, or a combination of these two movements. The exact part played by the different muscles of the larynx in producing these movements has not yet been determined with perfect accuracy.

We are concerned here only with the lateral excursions of the arytenoid cartilages as brought about chiefly by the contraction of the transverse muscle—a muscle which is also unique, being, as mentioned long ago by Krishaber ("Trachéotomie. De son opportunité dans les anévrysmes de la crosse de l'aorte"; "Mémoires de la soc. de biologie," 1866, p. 132), the only muscle in the economy "qui étend simultanément son action sur les deux côtés d'un organe symétrique." This muscle belongs to the phonatory group. Well developed in man, it is comparatively rudimentary in the lower animals. In some of the dogs on which we have experimented it has been found to be very imperfectly developed, yet the oblique fibers which cover it externally and run up in the ary-epiglottic folds are always prominent, and comparatively larger, we should judge, than in man. The crico-arytenoid articulation in the dog does not admit of nearly so much lateral movement of the arytenoid cartilage as is the case in more highly developed animals, and, consequently, the



action of the transverse muscle is not so marked. But by arranging a dog, thoroughly etherized or chloralized, as is shown in the

accompanying figure, we can have the larynx directly under our eyes, and the function of this muscle, as well as that of the other muscles of the intrinsic laryngeal group, can be studied at leisure.

It will be seen that the larynx has been turned out of the neck, and is supported in a perpendicular position by a cord attached to a horizontal cross-bar above. It has been separated from the hyoid bone, and the soft parts laterally have been divided. No large blood-vessels have been cut, and the recurrent laryngeal nerves are intact. The respiratory movements of the vocal bands go on as normally and as rhythmically as if the larynx had not been touched. This method was employed by Longet, and we have been surprised to see it referred to as a "grausame Erfahrung." Properly performed, it is not such, and we know of no better way of studying the actions of the intrinsic laryngeal muscles. It is a method, moreover, that can be utilized for class demonstration, and we venture to think that, if more would study these muscles in this manner, there would be greater unanimity of opinion in regard to their functions. The sides of the thyroid cartilage can be cut away, so that all the muscles are easily reached. Even after the death of the animal the muscles retain their contractility for about half an hour. The mucous membrane having been stripped from them, each one can in turn be stimulated by means of an electrode arranged like a forceps, so that its platinum points may be separated widely enough to touch both vocal bands at the same moment, or they can be brought so near together as to stimulate any part of a single muscle.

We are concerned at present only with the arytenoideus transversus. Unlike most other muscles of the body, we can not speak of this as having an origin and an insertion. It has no tendon. It is simply a bundle of muscular fibers attached to two freely movable parts, being imbedded in, and occupying most of, the entire extent of the posterior concave surface of each arytenoid cartilage. Its office is to tend to draw the arytenoid cartilages together. For in the emission of every vocal sound there is always a lateral movement of these cartilages inward, in addition to the inward rotation of the vocal processes. Now, this single muscle of double attachment receives its nerve-supply from at least four different sources. In case one of the recurrent nerves is paralyzed, it is still bountifully supplied with nerve-force from the recurrent on the opposite side, and from the two superior laryngeal nerves. The position of a paralyzed vocal band, in relation to the median line of the glottis, is

governed greatly by the position of the vocal process of the arytenoid cartilage. If, say, the left vocal process is seen in the position represented by the dot in the diagram, it may have come there either by a lateral movement of the arytenoid cartilage inward *as a whole*, or it may have been rotated inward. But it is the lateral movement, as brought about by the transverse muscle, that we wish to insist upon here. It is a physiological fact that, if one of the pneumogastrics is injured, the nerve on the opposite side gradually takes upon itself the work previously performed by both nerves. The arytenoideus transversus muscle is plentifully innervated, even though one of the pneumogastrics be paralyzed above the point of origin of the superior laryngeal nerve, and we regard this muscle as being a very important factor in determining the position of an immobile vocal band through the contraction of its remaining healthy fibers pulling the arytenoid cartilage of the paralyzed side inward. A vocal band may assume different positions in cases of complete paralysis of the recurrent nerve, and if we judge, from the position alone of a paralyzed vocal band, that a certain muscle is at fault, we shall, in many instances, draw mistaken inferences.

We have, probably, all of us, the same mental picture of the so-called "cadaveric" position, and the appearances of the glottis after death are so constant that this term is amply justified. But any one may convince himself, by examining a large number of cadavers, that there are exceptions to the general rule of post-mortem glottic appearances. The drawing herewith submitted, made by Dr. Quincy from a specimen taken from the dissecting-room of the Harvard Medical School, is one such exception which we have recently met with.

There was also an anomalous distribution of the left superior laryngeal artery in this subject, inasmuch as it passed through the foramen thyreoideum. On the right side of the thyroid cartilage the foramen was of only about the size of a pin, and the artery on that side pursued its normal course. It was subsequently ascertained that the subject from whom this larynx came was a woman sixty years of age, who had been demented for the last few years of her life. There had been no affection of the voice. We have seen in the living subject a bilateral paralysis of the vocal bands

where the positions corresponded almost exactly with those figured in this drawing, but we are at a loss to account satisfactorily for the appearances.

It has been remarked by Ruskin that hundreds of people can talk for one that can think, but thousands can think for one that can see. In our work with the laryngoscope it is our task in the first place *to see*, and then to interpret correctly what we have seen. How many of the recorded cases of bilateral paralysis of the posterior crico-arytenoid muscles were really contractions of the adductors, or perhaps paralysis of both recurrents? Who is justified, from the picture in the laryngeal mirror, in diagnosticating an uncomplicated spasm of the lateral crico-arytenoidei? Why should not marked relaxation of the internal thyro-arytenoidei, or of the elastic fibrous tissue connected with them, give us the same wavy outline that we expect to find in paralysis of the thyro-cricoids? If we see a triangular opening in the posterior portion of the glottis, let us be sure that there is no mechanical obstacle to the approximation of the arytenoid cartilages before we pronounce it a paralysis of the transversus. If we could only know the unknowable, most of the reported cases of unilateral paralysis of the posterior crico-arytenoid muscle would, in all probability, turn out to be instances of recurrent paralysis. There are certain pathological factors also, such as paralysis with contracture, that may affect the shape and position of a motionless vocal band, but we reserve the pathological and clinical aspect of this question for a future study.

In conclusion, we wish to repeat that in our judgment the larynx is such a complicated organ anatomically, it is subject to such changes at different stages of life, its shape is so different in different people, its nerve-supply is so great, the arrangement of its muscles so liable to anomalies, that as surely as one attempts to formulate theories on the positions alone of paralyzed vocal bands—positions which may be controlled by intrinsic muscles of the larynx that are *not* paralyzed as well as by those that are—just so surely will one be led unconsciously into erroneous mental inferences.

Discussion.

The discussion of Dr. Hooper's paper was opened by the reading of a paper by Dr. Frank Donaldson, Jr., of Baltimore, who stated that he had undertaken to verify some of the experiments presented by Dr. Hooper in his paper read before the association last year by original experiments of his own. From some he had obtained the results described by Dr.

Hooper, while from others he had arrived at conclusions different from those reached by the latter.

Dr. Hooper said that he felt very much indebted to Dr. Donaldson for having taken up this work, for it was only by getting many interested in the subject, and bringing forth their results and comparing and criticising them, that we could ever hope to arrive at the truth. The reader had prepared his paper in the friendliest spirit toward Dr. Hooper, but it would have been more gratifying if he had read his paper on "The Respiratory Function of the Human Larynx" with closer attention, and then quoted it correctly and accurately. He objected very strongly to the wholesale manner in which he had been misunderstood by him, yet he recognized that it was unintentional. Dr. Donaldson very oddly understood, from reading his paper, that *none* of his experiments had been verified. If such had been the case, the paper would never have been presented to the association. Dr. Donaldson had laid great stress upon what he called "his [Dr. Hooper's] theory of the innervation of the larynx." He was not aware before that he had had a theory on the subject. In his paper referred to he detailed the results obtained from certain experiments, and, in passing, offered, more as a suggestion than any thing else, that they might be explained in a certain way. The reader had expressed agreement with him upon one point in which he had least expected support, and had disagreed with him upon points that admitted of no doubt, and were so firmly established by repeated experiments that he was convinced that the reason he had failed to confirm his observations was due to some error in his method of experimentation. The phenomena which Dr. Donaldson's (perhaps) hasty experiments had failed to show him could be demonstrated with ease, and repeated as often as might be desired. Again, in regard to another small oversight, the reader had declared that he had said that he had observed the same effects with morphine, chloral, and chloroform as with ether. He had never made such a statement. He understood, with regret, that the reader's paper was to appear in the July number of the "American Journal of the Medical Sciences," since it contained so many statements which were inaccurate.

Dr. F. I. Knight said that the association was to be congratulated upon having members who could contribute such valuable work as the investigations of Dr. Hooper and Dr. Donaldson, and knowing, as they did, the weeks and months required to accomplish such results, he thought that their thanks were particularly due them. At the same time he thought all the results of experiment upon the lower animals should not be applied without care to man. The mechanism was so complex that slight variations in structure might affect the mode of action very materially. He would like to call attention to one or two incidental points elicited by the paper. He did not think that the supply of motor filaments from the superior laryngeal to the arytenoideus transversus muscle, as claimed by Exner, could be considered constant without further observations. In regard to the action of this muscle, he did not believe

that it, being attached principally to the posterior surface of the arytenoid cartilages, the articulation being intact, could by its contraction approximate the vocal bands. Some difficulty had been experienced by some gentlemen in diagnosticating between the cadaveric position of the cartilage and the position of abductor paralysis. There could be no mistake if we regarded the position during phonation carefully. If the line of the glottis was vertical without any motion of the vocal process on the suspected side, the case was one of abductor paralysis. If, on the other hand, the glottis was oblique, then all the muscles could be considered paralyzed. In regard to the question between bilateral paralysis of the abductors and spasm of the adductors, it seemed to him absurd to suppose that real spasm of the adductors could continue week after week, month after month, and year after year, the cords being perfectly immobile near the median line. He would consider such a condition one of "contraction," on account of a giving out of antagonistic muscles, and not a spasmodic action against healthy antagonists, etc. The irritability of the abductor muscles noticed by Dr. Donaldson would be interesting to those gentlemen who believe in a proclivity of these muscles to paralysis.

Dr. S. Solis-Cohen said that he should be glad to show Dr. Knight cases of persistent spasm of the extremities from irritative lesion of the nervous system. One case then under observation exhibited, in consequence of an injury affecting the cervical spine, very curiously distributed lesions. On one side three fingers were rigidly extended at the metacarpo-phalangeal articulation. On the other side some were flexed, some extended. It was known that there was such a disease as spastic paraplegia. He could see no reason why we should perform, or accuse Nature of performing, a physiological laryngectomy, and he therefore failed to discover any absurdity in Dr. Krause's application to the larynx of pathological factors known to exist in other regions. With regard to adduction of the vocal bands, there was one muscle that he had not heard mentioned that day, and that was the intrinsic muscle of the vocal bands, the thyro-arytenoid. From its anatomical relations, its contraction must assist in pulling over the vocal processes. He agreed with Dr. Knight in considering the position and relative angle of the vocal processes, the vertical line, as he called it, the test of the median position of the vocal bands. That the posterior crico-arytenoid muscle, acting simultaneously with all the other muscles, assisted in producing this position, he was convinced. Acting without the concert of the other muscles, it would, of course, tend to separate the cartilages posteriorly by a rotary motion. If it were paralyzed, there would be some relaxation of the tension of the vocal bands, some want of fixation. He had been exceedingly interested in Dr. Donaldson's experiments, and, with the assistance of Professor Brubaker, of Philadelphia, trusted to be able to confirm his observations, as fully as those observations confirmed an hypothesis which he had in another connection ventured to advance, concerning the action, physiological and pathological, of the muscles of the larynx and of the

recurrent nerve. It seemed *a priori* reasonable, and indeed it was now regarded as a physiological law, that those muscles most frequently used respond most readily to nervous influence; that the nerve-fibers supplying these muscles offered the least resistance to the transmission of nervous force. It might be formulated thus: Directly as the use was the response of the muscle; inversely the resistance of the nerve. It had been well said that no muscle in the body was more persistently used than the posterior crico-arytenoid. We should therefore expect its nerve-fibers to offer the least possible resistance to the current, and its contraction to take place with the liberation of the minimum of energy by the nerve-center. And Dr. Donaldson had found that it responded to a weaker artificial stimulus than did the constrictor muscles. The other muscles of the larynx were also of highly specialized function in man, though not in animals, a point to be remembered in experimentation, and they could also be expected to respond to slight stimulation, their nerves to offer low resistance, but not so slight or so low as in the case of the respiratory muscles. In addition to phonation, a voluntary function, there was another purpose subserved by the constrictor muscles, a reflex function, cough. The direct energization of all the muscles of the larynx proceeded from a single center, the vago-accessorius nucleus in the medulla. But the impulse that liberated this energy might come from any one of three sources; from the respiratory center for automatic respiration, from the cerebral cortex for voluntary respiration or phonation, from peripheral irritation, usually by way of the superior laryngeal, for cough. The respiratory impulses continuously traversed the recurrent nerve, and the respiratory muscles continuously acted. Additional impulses superimposed upon them overcame the higher resistance of the constrictor muscles, awakening in addition their voluntary or involuntary action. The combined action of both groups of muscles was necessary to proper phonation, but in cough the posterior crico-arytenoids might possibly cease to act, for irritation of the superior laryngeal might inhibit respiration at the center. This theory, it seemed to him, was confirmed by the experiments of Krause and of Donaldson; and there were also clinical facts supporting it. In a discussion in that room, about a year ago, he ventured to explain the fact that in many cases of tracheotomy for croup, despite the non-existence of mechanical obstruction to respiration in the larynx or trachea, it was impossible to remove the tube, on account of persistent dyspnœa, by attributing the difficulty not to lack of a will power from disuse as had been urged, but to interference of the will in an automatic function. The historic case in which a boy could breathe perfectly well with the tube out of the trachea, simply suspended from his neck by an encircling cord, but was attacked with alarming dyspnœa on any attempt to remove his necklace and charm, was well known. He tried so hard to breathe that he sent too much force into the larynx, closing it. Dr. Hering, of Warsaw, had recently published a number of cases, though in another connection, which contributed further to his belief in the correctness of these

views—cases of spastic aphonia, and dyspnœa, from reflex irritation. In one case, where the source of irritation was, he thought, a nasal polyp, the vocal bands, which in quiet respiration remained not far from the median line, could not be abducted voluntarily, and, when the patient tried to breathe, the effect of the increment of voluntary force was to immediately close the glottis. In the living case which Dr. J. Solis-Cohen had exhibited that day, and in the case the specimens from which he had shown, median immobility of one band with spasm of the mobile band had been observed, causing for a time the picture of so-called bilateral abductor paralysis. In the living case, this took place at times under our eyes, from excessive psychic stimulation; in the dead man it followed peripheral irritation, rendered tracheotomy necessary, and became permanent. Michael, of Hamburg, Thaon, of Nice, Hering, and others, had published cases of persistent hysteroid spasm, relaxing under anæsthesia, confirming Dr. Hooper's observations, yet immediately recurring with the return of volition, and rendering tracheotomy necessary. From these and other facts he thought we were justified in concluding with Dr. Hooper that volition was a factor in adductor contractions, with Dr. Donaldson that the abductors responded to slighter stimuli than did the adductors, with Dr. Cohen that his cases were instances of unilateral spasm, becoming bilateral. We could also see the necessity of taking a comprehensive view of the whole field of observation and of research before formulating allegedly infallible hypotheses. And with all diffidence, without dogmatism, with readiness to be convinced of error, yet with a firm conviction that future observations would still further strengthen the views advanced, he ventured to explain the entire train of physiological and pathological actions of the laryngeal muscles, upon the theory of a single local motor center, in the medulla, the vago-accessorius nucleus, from which proceeded two sets of fibers, one of low resistance to the constrictors, one of lower resistance to the dilators, respiration being an automatic function excited in obedience to impulse from the respiratory center, phonation a voluntary function energized in response to cortical impulse, cough a reflex act usually due to excitation of the local center by irritation of the superior laryngeal or other branch of the vagus, sometimes of the trigeminus. The principle was exactly the same as that taken advantage of in multiple telegraphy, where the differing resistance enabled two or more messages to travel at one time over the same wire.

Dr. Donaldson said that, while discussing the effects of electrical stimulation of the laryngeal nerves, it was to be noticed that Dr. Hooper had not said anything about the strength of the currents which he employed in his experiments. This was an important point. It was true that he only put down five experiments, but he had obtained the same results over and over again. He did not think that the difference in the results was due to a difference in the dogs experimented upon, as Dr. Hooper had suggested, but in the methods pursued. His results had been confirmed by others who had witnessed the experiments.

Paper.

"LARYNGEAL VERTIGO."

By FREDERICK I. KNIGHT, M. D.

AT a meeting of the Société de biologie in 1876, M. Charcot, during a discussion on a case of sudden death after thoracentesis, narrated the history of two patients in whom marked cerebral disturbance followed and seemed in some way dependent upon an attack of cough. The publication of these cases has been followed by others from Gasquet, Charcot again, Krishaber, Gray, Lefferts, McBride, Russell, and Massei. The distinguishing feature of the cases described has been that an attack of cough was immediately followed by giddiness, and also in all but two cases by momentary loss of consciousness, the patient fully recovering himself at once without any mental obscuration.

While it is the opinion of the writer that attacks of dizziness after cough are comparatively frequent, and temporary loss of consciousness probably not so rare as has been supposed, the fact remains that little attention has been accorded the subject, and it seems desirable to analyze reported cases, and record others, with the object, if possible, of explaining the mode of dependence of the cerebral symptoms upon the cough.

We have fourteen published cases on record, and these, with two which I shall add, will form the basis of my paper. I shall not weary you with any prolonged history of these cases, but simply give their essential points as far as I could obtain them.

A gentleman, forty-two years old, consulted me recently for a general bronchitis of about a year's duration. He was a man of robust physique, both his parents being still alive and well. He remembers that, when a boy, his head used to be held under the water-faucet by his father for what was called "congestion." He studied hard, and at one time in college suffered from insomnia. He lost a brother at the age of twenty-seven from inflammatory rheumatism, and had himself suffered an attack of this disease at the age of fifteen. He had been for a considerable time under great mental strain in the direction of enormous financial matters through very troublous times. He consulted me more on account of the urgency of his family physician than from any discomfort of his own, for he said that his cough at the time was not particularly troublesome; I found, on examination, his pulse to be seventy-six in the minute and regular. There were no morbid signs discoverable by auscultation of the

heart. The chest, however, was filled with sonorous and sibilant râles. He was put upon the iodide of potassium, the dose of which was gradually increased from ten to thirty grains three times a day, and a laxative for the bowels. The wheezing and cough began to improve at once, but on one occasion, after a day of great worry and fatigue, he had a fit of coughing, which was followed by loss of consciousness. He did not fall down, as he was sitting in a chair at the time, and his wife, who was near, caught him in her arms. There was no evidence of spasm of the glottis, there were no convulsive movements, and he quickly recovered full consciousness. He continued to improve under treatment, which, besides the iodide, included a small dose of strychnine and the removal of a small mucous polyp from one nostril, until he was comparatively well. He never had loss of consciousness but once, but has since informed me that, judging from his own sensations, he has often come near it.

The second case which has come to my knowledge occurred in the practice of Dr. J. P. Oliver, of Boston.

The patient was a widow, forty-seven years of age, who had been subject to attacks of dizziness in connection with digestive derangements. She had a granular pharyngitis, and had been subject to winter cough for ten years. During one attack of cough she became dizzy, and then lost consciousness. There was marked congestion of face and neck at the time. She was always relieved of the cough by the local use of weak astringents. She never had loss of consciousness but once.

Most of the records of cases, having been made without reference to special investigation, are more or less deficient in points about which more accurate and fuller information would be very desirable, but such important facts as are given I will tabulate.

In the matter of sex, a curious fact strikes the eye in that all the reported cases but one have occurred in men, one female having been added to the roll by myself to-day.

The average age of the thirteen whose ages are given is forty-nine and seven thirteenths.

The cough which introduced the attack was described as slight in six cases, spasmodic or a fit of cough in two, and a severe fit of cough in three. This was said to be preceded by burning, in addition to the usual tickling, in the larynx in three cases.

Momentary loss of consciousness is stated as having occurred in fourteen cases; one patient fell, but declared he was not unconscious; and in another (McBride's) there was never loss of consciousness. Such a record as this, I feel convinced, happens because only the severe cases attracted sufficient attention to cause their publication.

Dizziness was mentioned in eleven cases, and in six it was stated

as sometimes occurring after cough without any subsequent loss of consciousness. Two patients had been subject to dizziness previously without cough.

In four patients there seems to have been decided evidence of a laryngeal spasm; in one this seems doubtful. Krishaber says that in his case there was, besides the spasm of the larynx, a sudden arrest of all the muscles of respiration. Once his patient was strangled by tobacco-smoke accidentally blown into his face, and could not breathe for several seconds, suffering intensely, but he did not on this occasion lose consciousness.

There was marked congestion of the head and face in four patients, while one was said to be pale, and another very pale.

There were convulsive movements of the limbs in three cases; in one of these also of the head, and in another of the face.

It is distinctly stated in seven cases that there was no mental confusion immediately after the attack; in one the patient was said to be giddy and confused "for some little while," and in one there was said to be slight mental confusion afterward.

In six cases it is stated that the patients were personally free from other evidences of nervous disease, and in four there were such evidences. In Krishaber's case the first loss of consciousness occurred from sudden emotion, and was not preceded by cough. Subsequent attacks, even though caused by emotion, were preceded by cough. In McBride's case there was a tendency to spasm, exaggerated tendon reflex, ankle clonus, spasmodic action of palate muscles, and stricture of the gullet. Gray's patient had been subject, seventeen years before, after a scalp-wound by a bullet, to losses of consciousness like the present, but without cough, which continued for two months. Russell's patient was stated to be of a decidedly nervous constitution.

In regard to other evidence of disease, five patients are stated to have had chronic bronchitis, three to have had simply a cough, two had gout or rheumatism, one had syphilis, one had diabetes, and one probably had catarrhal pneumonia.

In none of the attacks was there any biting of the tongue, frothing at the mouth, or involuntary micturition.

Local examination showed hyperæmia of the larynx in six cases, granular pharynx in four, and was negative in two cases.

The record shows that in seven cases treatment relieved the patient, temporarily at least, of the symptoms under discussion. The most common forms of treatment were by astringents to the pharynx,

counter-irritation over the larynx, and the administration of bromides internally.

I have announced the subject of my paper as "Laryngeal Vertigo" because Charcot has called attention to his cases under this name, and because, while I believe it to be an entirely erroneous designation, other names which have been proposed are also open to the objection that the nature of the affection is unwarrantably assumed by using them. Krishaber reports his case, for instance, under the title "Spasm of the Glottis in the Adult." Gray designates the affection "Laryngeal Epilepsy," while McBride strengthens Krishaber's definition by calling it "Complete Spasm of the Glottis in the Adult."

Now, in the first place, it is necessary for us to consider if there is evidence in the cases reported of what can properly be called vertigo. I think not. If any one of my hearers has seen, or had described, or will get a patient with aural vertigo to describe an attack to him, I believe he will agree with me. Let us see what the usual train of symptoms in Ménière's disease is. First a tinnitus aurium, then the surrounding objects begin to revolve round and round, or over and over, or the patient feels as if going round himself; he reels if walking, and finally may fall, but seldom becomes unconscious, and ends with an attack of nausea and vomiting. A reflex aural vertigo presents much the same course, only tinnitus aurium is not so commonly a precursor. I think, from a comparison of this statement with the history of our cases, it will be evident that they do not present what can properly be called a vertigo, but simply a giddiness, or, as it is sometimes called, a lightness of the head, a mild degree of which nearly every one has felt after coughing or making prolonged expiratory effort of any kind. If it were a real vertigo, a serious disturbance of equilibration, an easy explanation of its occurrence would be to place it in the same category as the stomachic vertigo; in fact, an aural reflex, brought about by the connection of the pneumogastric with the labyrinth through the sympathetic.

Let us consider for a moment now the question of epilepsy. It is evident that none of the cases presented the severe form of this disease. There was no biting of the tongue, no frothing at the mouth, no involuntary micturition, and no mental impairment afterward.

May we class the attack, as Gray would have us, as one of "le petit mal"? If, as Gray suggests, we use the term epilepsy in its

more catholic sense (as Hughlings Jackson employs it) when speaking of all sudden actions of nerve-cells, then we could not exclude from this category any case of temporary loss of consciousness, no matter what intermediate mechanism there might be, and such decidedly neurotic cases as Gray's and Krishaber's might well be here placed. It will be remembered that Gray's patient had similar attacks, years before, after a scalp wound, and that Krishaber's patient had his first attack of loss of consciousness after sudden emotion, without any previous cough.

The fact of loss of consciousness, however, does not compel us to consider a case epileptic, for asphyxia and syncope may produce temporary unconsciousness. Neither does the fact that there were convulsive movements of limbs in three cases make them epileptic, for convulsions are by no means rare in the laryngismus and whooping-cough of children. There is no doubt about the possibility of the production of "reflex epilepsy" by a pediculated polyp in the larynx, as shown by Sommerbrodt's case.* This patient had, without doubt, genuine epileptic attacks with all the characteristic symptoms and results, which disappeared at once after the removal of the polyp. The same patient, fifteen years before, had a short series of epileptic attacks, which were attributed to a cicatrix in the dorsal surface of the right hand, and which disappeared after the excision of the cicatrix. Other similar cases are well known.

The question for us, however, is whether such an explanation is necessary for cases of loss of consciousness following cough. While I do not deny that mild epileptic attacks *may* originate from slight sources of irritation in the larynx, it seems to me that we have more reasonable explanation in other ways.

Our profession has long been familiar with loss of consciousness in sudden spasm of the glottis, notably in cases of foreign body in the larynx, but also in children with laryngismus and whooping-cough.

Let us, then, look at the possible mechanism of dizziness and loss of consciousness through the agency of spasm of the glottis. Proof of the occurrence of spasm of the glottis, however, is given in but few of our cases. The best presentation of this theory has been given by McBride.

McBride assumes that in every case the attack was "preceded by a short cough, or, in other words, by a series of spasmodic in-

* "Berl. klin. Woch.," September 25, 1876.

spirations, followed by spasmodic expiration with partially closed glottis." *

McBride believes the attack to be due to the physical condition within the thoracic cavity caused by a complete spasm of the glottis occurring just after a full inspiration. He gives sphygmographic tracings showing the effect on the pulse of taking a deep inspiration, and then attempting to perform the expiratory act with the glottis closed. The result is an almost complete obliteration of the pulse tracing, and one of the gentlemen experimented upon experienced a momentary threatening of syncope just after one of the tracings was taken. McBride says that the increased atmospheric pressure on the walls of the alveoli will in all probability prevent, or tend to prevent, the free passage of blood through the lungs, and therefore lessen the blood in the left side of the heart, and the pressure on the large intra-thoracic veins must hinder the return of venous blood, and thus we can understand that the face will be pale or turgid, according as the spasm of the glottis lasts for a longer or shorter time. He says it is also quite conceivable that the compression of the heart between the unyielding lungs and the chest-wall may help to paralyze its action. The possibility of the compression of the pneumogastric in certain cases, and thus inhibition of the heart's action, will also occur to us, and recalls to mind the ease with which Czermak was said to stop the action of his heart at will by pressing his pneumogastric against an osseous tumor of the neck.

McBride quotes from the very interesting article of Weber † to substantiate his theory. Weber points out that forced expiration with closed glottis causes weakening, and eventually stoppage, of the heart's action. He shows by experiments that if severe pressure be exercised, even by the expiratory muscles alone, the pulse, because the supply of blood to the heart through the venæ cavæ is cut off, immediately becomes small, but continues until the blood contained in the thorax has emptied itself through the left side of the heart into the aorta. Then, usually after three to five beats, the pulse stops altogether, because no blood reaches the aorta from the empty heart, and only returns after the compression of the thorax has ceased. On one occasion Weber, while experimenting on himself, produced actual syncope. During the interval of unconsciousnses

* As I have before stated, Krishaber's patient had his first attack without precedent cough, which may place this one attack at least in a different category.

† "Ueber ein Verfahren den Kreislauf des Blutes und die Function des Herzenswillkürlich zu unterbrechen." Müller's "Archiv," 1851, p. 88.

slight convulsive twitchings of the face were noticed by the by-standers, and, as consciousness returned, all recollection of what had taken place was so obliterated that, in spite of the fact that his pulse was being counted aloud as before, he could not at first remember where he was and what was happening.

Blowing on certain wind instruments is a similar procedure, and this, as is well known, often produces very uncomfortable sensations in the head.

Now, inasmuch as conclusive evidence of spasm of the glottis is absent in the majority of cases reported, it becomes us to consider whether such spasm is really necessary for the production of the symptoms under consideration. I believe sufficient disturbance of the cerebral circulation can be produced by the forced expiration of cough, or by rapid respiration, to cause dizziness, or even momentary loss of consciousness. I referred to this latter idea in the discussion of Dr. Lefferts's paper, read before this association three years ago. Who that practices auscultation has not had patients become dizzy when they were made to keep up forced respiration a little too long?

In recent years we have been made familiar with the production of analgesia—*i. e.*, the deprivation of the sense of pain, without loss of the sense of touch or feeling, by rapid breathing of atmospheric air, through the writings of Dr. Bonwill and others, of this city. Dr. Hewson first called attention to this method of producing insensibility to pain for minor surgical operations under the name of Bonwill's method of inducing anæsthesia,* and Bonwill himself, later, tried to explain this mode of producing insensibility to pain.† As one cause he assigns the retention of carbonic acid in the blood, and quotes the well-known results of experiment: that the percentage of carbonic acid exhaled diminishes as the rate of respiration is increased, and infers from this that there is a retention of carbonic acid in the blood, and consequent asphyxia. This assumption is unjustifiable, as experiment has fully shown that, while the percentage of carbonic acid is diminished as the rate of respiration is increased, the total amount of carbonic acid is steadily increased. Whether so much more is generated by rapid respiration that, notwithstanding increased elimination, there still remains an abnormal amount in the blood, we do not know. Speck was unable to establish the fact, with increased absorption of oxygen under increased

* "Philadelphia Medical Times," March 4, 1876.

† Ibid., July 17, 1880.

pressure, either of an increased oxidation on increased temperature, or an increased formation and expiration of carbonic acid.*

It is possible that the dizziness and other cerebral symptoms of rapid respiration are due, if in any way connected with the interchange of gases, to oxygen intoxication.

It seems, however, fair to assume that an excess of that condition, whatever it may be, which causes the peculiar sensations in the head of any one after forced breathing, and frequently after hard cough, may cause momentary unconsciousness.

To recapitulate. It is admitted that we have uncomfortable sensations in the head, and sometimes loss of consciousness following cough. The simplest explanation of the symptoms would seem to be that there is a direct disturbance of the cerebral circulation by compression of the large blood-vessels, and even of the heart itself.

The mechanism of this is easily understood when there is forced expiration against a glottis closed by spasm. With cough there is a repeated forced expiratory effort against an intermittently closed glottis, but, even without this, we know that there is sufficient disturbance of the cerebrum through greatly increased rate of breathing to cause very uncomfortable sensations in the head, and to produce momentary insensibility to pain.

In order to explain why one person should experience such disturbances from cough, and another not, is difficult, and we are obliged to resort to the old theory of idiosyncrasy. The fact that some of the patients had lost consciousness before, without cough, allows us to suppose that in case of predisposition to such condition the mode of excitation may be different in different attacks; that the tendency to lose consciousness may be acted upon in very different ways, just as a patient who is liable to syncope may faint from a variety of causes, *e. g.*, exposure to bad air, loss of blood, or simple emotion.

Bibliography.

Charcot, "Comptes rendus des séances et mémoires de la société de biologie," 1876, p. 336.

Gasquet, "Practitioner," August, 1878.

Charcot, "Le Progrès médical," 1879, p. 317.

Krishaber, "Annales des maladies de l'oreille et du larynx," 1882, p. 182.

* Hassall, "The Inhalation Treatment of Diseases of the Organs of Respiration," London, 1885.

Gray, "American Journal of Neurology and Psychiatry," November, 1882.

Lefferts, "Archives of Laryngology," 1883, p. 165.

McBride, "Edinburgh Med. Journal," March, 1884.

Russell, "Birmingham Med. Review," August, 1884.

Massei, "Giornale Internazionale delle Scienze Mediche," anno vi; "Internationales Centralblatt für Laryngologie und Rhinologie," 1885, p. 21.

Paper.

FURTHER HISTORY OF THE CASE OF PARALYSIS OF THE POSTERIOR CRICO-ARYTENOID MUSCLES PRESENTED AT THE FIRST MEETING OF THE ASSOCIATION, 1879. WITH REPORT OF AUTOPSY AND EXHIBITION OF SPECIMEN AND MICROSCOPIC PREPARATIONS.

By J. SOLIS-COHEN, M. D.

As the history of the case was given when the patient was exhibited before the association seven years ago, it is unnecessary to repeat it in detail. To quote from the second edition of my book on "Diseases of the Throat," 1879, p. 654.

"In October, 1876, a gentleman, forty-six years of age, of good physique and in apparent health, had suffered for two years or more with cough, dyspnœa, and occasional obstruction, and alarming spasm of the larynx, which had eventuated in loss of consciousness in the street on two occasions. His respiration was labored, inefficient, and attended with such inspiratory stridor in sleep that it could be heard all over his residence. Early in life he had a suppurative inflammation of his left ear, which had eventually subsided. He had been addicted to excessive smoking (fifteen or sixteen cigars a day, and an occasional pipe or two in addition) for many years. Hearing was somewhat impaired. Laryngoscopic inspection revealed paralysis of the posterior crico-arytenoid muscle of the left side, with a tendency to spasm of the glottis, as provoked by the examination. Interrogation revealed the fact that irritation of the left external auditory meatus always induced cough, followed by spasm of the larynx, so that the patient dared not cleanse the ear for fear of exciting a paroxysm. A tentative treatment was instituted, with the addition of a constant supply of nitrite of amyl at hand for inhalation on the occurrence of a spasm. All went well for a few days, when an inadvertent manipulation of the ear brought on a terrific spasm that was reported as well nigh fatal. Recounting this to me next day, while awaiting his attending physician, Dr. Hinkle, in my reception-room, he placed his finger in his ear to illustrate the occurrence, when a severe paroxysm of spasm was provoked just as Dr. Hinkle entered the room,

in time to assist me in controlling it by the prompt administration of vapor of chloroform. On the following day I performed tracheotomy, and the patient has been wearing a tube for more than two years (1878). After the operation the patient's hearing improved and remained improved. Color-blindness, however (chiefly interchange of red and green), soon supervened, and ophthalmoscopic inspection revealed progressive atrophy of the optic nerves, which has since increased to very indistinct vision. The tendency to cough and to spasm on titillation of the ear continues, but no lesion is apparent on inspection. Within a few weeks after the operation the right vocal cord became paralyzed likewise, and at the end of about three months the paralysis became so complete, and the tension of the vocal cords and ary-epiglottic folds so marked, that it is difficult to believe that there is not in addition permanent spasm of the arytenoid and lateral crico-arytenoid muscles; for from that time to the present (1878), now more than two years, I have never seen the glottis in any other condition, although there is sometimes just enough separation of the arytenoid cartilages on forcible inspiration to see that they are not welded together; otherwise the condition simulates adhesion of the arytenoid cartilages, as I have seen it in stenosis after syphilis."

During the next four years I saw this patient at various irregular intervals. His larynx always presented the same picture of apparent tonic spasm of the constrictor muscles. Irritation of his ear always produced spasmodic cough. The only special complaint he made was of intense cold in his testicles, as though ice were continuously at the posterior part of his scrotum. He became completely blind. His hearing continued good. His voice remained powerful; he could speak loudly without occluding the orifice of his tube. I did not see him during the last four years of his life. In the early portion of the present year the physician in attendance at his home in another State sent to me for a special tube that I had used shortly after the tracheotomy, as the tubes worn for so many years were giving trouble, by irritating the trachea, probably on account of progressive emaciation in the tissues of the neck. I learned that the patient was gradually sinking by asthenia. He died, and I was offered a long-promised autopsy. Professor Forbes, of the anatomical chair of Jefferson Medical College, was kind enough to accompany me and to make the dissection. With great skill he removed in one continuous mass all the structures involved in the question as to the origin of the laryngeal lesion—external auditory meatus, middle ear, Eustachian tube, palate, pharynx, œsophagus, trachea, and adjacent portion of lungs, aortic arch, heart, recurrent nerves, pneumogastric, cervical cord, medulla, and brain.

After the autopsy I learned from the family that for four years, that is, since my last interview, the patient had had difficulty in walking; that for the last nine months of his life his feet slipped apart when he tried to hold anything in his lap, and that he would strap his legs together before placing upon them the tray from which he fed; that for five months he had been compelled to get into bed on the right side, and then lift his left leg into the bed. He sat with his right leg crossed over the left. The right leg was emaciated and apparently much shortened: probably from being drawn upward upon the pelvis. For eighteen months he had been in the habit of having the calves of his legs tied and strapped together as tightly as possible to relieve pain, and sometimes had his arms bound up to relieve a sense of cold. Numbness of the hands and of the face existed for the last twelve months. For the last two weeks his eyeballs had become fixed. For the last three weeks he had complained of heat, although he had always complained of cold previously. His voice remained very powerful to the last. Toward the last years of his life, I was told, his spasms had subsided entirely, and his cough had almost entirely ceased also. His appetite had remained enormous throughout.

During the autopsy we noticed nothing that threw special light on the case. The general emaciation was extreme—so great that it was hard to recognize the body of my very robust patient. The right leg was much shorter than its fellow. The nares, turbinated bodies, pharynx, palate, and other structures exposed were normal, except two points of erosion in the trachea from attrition by the tube. These occupied portions of the seventh and eighth cartilages. The lungs were healthy, and so were the pleura and the bronchi. There were a very few pleural adhesions. Two darkly pigmented bronchial glands, of the size of small beans, were adherent where the left recurrent nerve diverged from the pneumogastric.

The specimens were immediately carried to Professor Osler, who carefully dissected them, and examined them macroscopically for me that night, placing selected portions of the structures, with the assistance of Dr. Griffith, in preservative fluid for microscopic purposes.

The result of the examination, communicated by Dr. Osler and Dr. Griffith, is as follows:

Heart.—Of medium size; left ventricle firmly contracted; mitral valve normal; left auricle contains a small clot adherent to the valve; wall somewhat hypertrophied; aortic valve normal. Right auricle contains firm leathery clots adherent to valves; valves of right side normal;

tricuspid orifice a little large. Aorta a little large; atheromatous patches on the posterior aspect. Left pneumogastric, as it passes over the arch, looks natural. No adhesions. At point of origin of recurrent laryngeal are two pigmented lymphatic glands, closely adherent to the cardiac and pulmonary branches. Traced in its source upon the windpipe, there is no compression. The nerve has a grayish-white natural appearance. The right recurrent is unobstructed in its course.

Brain.—Cerebrum removed. Base: vessels of circle natural in appearance. A few flakes of atheroma on the carotid, Sylvian, and basilar arteries. Olfactory nerves normal in size and in appearance. No lymph, no exudation, no matting about the membranes. Optic nerve and commissure grayish-white, small, and atrophic; the tract scarcely visible. Corpora albicantia natural. Third nerve represented by a small grayish-white thread.

The crura were then cut close to the pons. Pineal gland large.

Third ventricle: Commissures normal. Velum large.

Right hemisphere: General surface of the pia normal in appearance; vessels not overfilled; no special turbidity; no adhesions; convolutions full; sulci natural; no œdema of the membranes. Sections of the hemisphere transversely show no focal lesions or degenerations anywhere. No excessive amount of fluid in the ventricles.

Left hemisphere: Convolutions and membranes look natural. No adhesions. On slicing, a small triangular cavity, about two by four millimetres in extent, is found in the outer section of the lenticular nucleus.

Medulla, pons, and cerebellum: These were removed together. Vertebral and basilar arteries normal; pons symmetrical; sixth pair of nerves grayish, and look quite atrophic; twelfth pair, opaque, white; fifth pair, small, grayish, evidently much wasted; seventh and eighth pairs, opaque, white, full in size, look natural; ninth pair, fibers distinct, clear, grayish white, apparently not atrophic; on the right side they look somewhat larger and more abundant than on the left. Eleventh pair, opaque, white, apparently of normal size.

Anterior pyramids: No obvious change apparent. At its lower part, the right is decidedly smaller than the left. Right olivary body markedly smaller in size than the left; it has lost its fullness, not standing out with anything like the prominence of the left. Arachnoid on the posterior aspect of the medulla is thin and clear. Fourth ventricle exposed: Pia mater a little adherent and thickened beneath the cerebellum. In the lower aspect of the floor, just in front of the calamus, there appears to be a grayish translucency, with two distinct conical or linear depressions just within the restiform bodies. The root-fibers of the seventh are distinct, more so on the right than on the left side. The left restiform body does not look so full in its upper part as the right does.

Microscopic Examination.—Sections were made from both recurrent nerves shortly after their departure from the pneumogastrics. Also from several portions of the pneumogastrics, including the vago-accessory nu-

cleus, within one fourth of an inch of the calamus, from various parts of the medulla, and from the cervical cord a short distance below the calamus. All these were stained after the method of Weigert, so admirably adapted to the revealing of any degeneration of nervous tissue. No pathological change whatever was discovered in the medulla. The olivary bodies were microscopically alike on the two sides. No pathological change was discovered in the left pneumogastric or in the left recurrent. In the right pneumogastric, on the other hand, a diminution in the number of nerve fibrils was evident. In the right recurrent, near to the point where it leaves the pneumogastric, this degeneration of nerve fibrils was very marked. Certain sections from this portion showed some of the funiculi to be of perfectly healthy appearance, and others adjoining them to be completely degenerated. Other sections, made slightly higher in the course of the nerve, revealed one half of a large funiculus to be entirely normal, while the other half contained scarcely a single fibril in which degeneration had not taken place. The line of demarkation between the normal and the affected portions was very sharply defined. The cervical cord, with the exception of the postero-median columns, was unaffected. The regions referred to exhibited some slight degeneration of axis cylinders with thickening of connective tissue.

The Larynx.—The posterior crico-arytenoid muscles of both sides were wasted to a certain extent. That of the left side, especially, showed a degeneration of many of the muscular fibers, with a decrease in their numbers, and an increase in the amount of fibrous tissue of the parts. The oblique fibers of the arytenoideus going from the base of the left cartilage to the tip of the right were also wasted. The remaining muscles were apparently normal.

The larynx herewith exhibited shows the muscular atrophies just mentioned. It will be noticed, likewise, that the vocal bands are not in the cadaveric position, but that they are in the position of phonation—fixed in the middle line. The edges of the central portions of the bands are slightly bowed, owing to the manipulations to which they have been subjected since their removal from the body; but they are in sufficiently close contact to verify the picture published in my book several years ago. There is also some erosion of tracheal mucous membrane, with absorption of the central portion of the seventh and eighth rings from attrition by the tube, which became too long as the patient underwent emaciation toward the last, necessitating a change in the length of the cannula.

Several of the microscopic sections are under the instruments now upon the table. They comprise sections from the medulla just below the calamus; within one fourth of an inch above the calamus; within one half inch above; and at the middle of the valve of Vieussens.

It will be seen that there are no vascular changes, and no essential changes to be noted in the ganglionic cells or in the nerve fibers other than intense pigmentation. There are several sections, also, from the two pneumogastrics and from the two recurrents. Although the neurotic lesion was manifested first on the left side, the recurrent of that side is seen to be intact. In the sections through the right recurrent, at about one inch beyond its point of separation from the pneumogastric, it will be seen that fully one half of the nerve fibers have failed to take the hæmatoxylin stain. In the atrophic region there are from forty to fifty fibers which retain the medulla, and are stained.

The hope, long entertained, that careful examination of this case after death would cast some important light on the pathology of this class of laryngeal neuroses, has not been realized. The disease is evidently central in origin. The nature of the initial lesion producing the degeneration has not been revealed. Sufficient has been shown to prove that the vocal bands can remain in a condition of tonic spasm for a long series of years, and retain that position after death. It is a remarkable circumstance that the left recurrent should be apparently intact, while degeneration should be so marked in the right nerve, which became involved so much later. I may mention that I made inquiry as to whether a mistake might not have been made between the two recurrents, and was assured that no such mistake could have been made. Then, too, the atrophic condition of one set of the oblique fibers of the arytenoideus without participation by any other portion of the constrictor group of muscles is unexpected. The histological pathology of the spinal lesion, so far as our examination went, is that of a case of ascending sclerosis; yet the laryngeal manifestations preceded the others by several years. I greatly regret that I did not have the opportunity for clinical study of the interesting developments of the last years, for the history gathered from the family does not warrant a diagnosis. It is also to be regretted that the entire spinal cord was not removed for study as well as some of the muscles of the extremities. The slight degeneration of the columns of Goll I presume to be secondary, though the absence of clinical studies of this condition as a primary system lesion leaves the question, like too many others in this interesting case, an open one. No lesion of the cortex was discovered, no lesion of the local laryngeal center in the medulla, no lesion pointing to an involvement of any portion of the respiratory centers. The only cerebral condition discovered that may have been connected with

the laryngeal symptoms is the small cavity in the lenticular nucleus. I regret that I have no diagram of its site, nor more exact description to offer. If this denotes an interruption in the course of what has been called the "hypothetical cortico-medullar tract" of laryngeal motion, it may have a bearing upon the solution of the case. Other points upon which our examination is incomplete suggest themselves, but it is useless to recapitulate them. Much to my disappointment, I can only lay the facts before you, for even negative facts are of value, and defer theory or explanation to a time when more positive evidence shall be available. So far as the ætiology is concerned, I always suspected syphilis, though I have no evidence of that infection to proffer.

Discussion.

Dr. F. H. Hooper.—I would like to ask if the blood-vessels in the neighborhood of the recurrent nerves were examined. This is very important. Dr. Robinson, of Durham University, England, in his prize essay on "Endemic Goître," speaks of the vascular origin of abductor paralysis. He points out that the posterior crico-arytenoid muscles are supplied by the inferior laryngeal artery alone, and degeneration of these muscles may result from interference with their blood-supply. In a recent paper by Bäumler on "Laryngeal Paralysis in Chronic Lung Affections," the autopsy of one case showed that the arteries near the diseased recurrent nerve were markedly changed, the tunica adventitia being thickened in all, and the media in some, but the most marked change was in the intima, which at some places was so thickened as almost to cause obliteration of the vessels. There was chronic indurative neuritis in this case, which was the result either of inflamed bronchial glands or of inflammation derived from nutrient blood-vessels.

Dr. Cohen.—Dr. Osler informs me that the small vessels of the recurrents exhibit slight hyaline degeneration; not more than was to be expected, and not sufficient to be of importance. The larger vessels were not examined.

Paper.

A CASE OF CONGENITAL DEFECT OF THE EPIGLOTTIS ILLUSTRATING ITS FUNCTION IN DEGLUTITION.

By FRANK DONALDSON, M. D.

I INVITE the attention of the association to a brief study of the functions of the epiglottis during deglutition, together with the report of an illustrative case where this fibro-cartilage was congenitally defective.

Our inquiry is limited to the one point in the second period of

swallowing, which includes the time from the moment the alimentary bolus passes the isthmus of the fauces until it is seized by the œsophagus. In regard to the physiological explanation of the first and third periods of the process of deglutition there seems to be no divergence of opinion, nor indeed is there as to the fact that, in the second period, as soon as the food passes through the anterior pillars of the fauces, or even before it reaches there, the soft palate, through reflex action, is raised by the levator palati from its vertical and depressed position and becomes horizontal, with its superior surface convex, and it thus is made to touch the posterior wall of the pharynx.

This elevation of the soft palate causes a distinct rise of pressure in the nasal chambers. By the contraction of the palato-pharyngeal muscles which lie in the posterior pillars of the fauces, the curved edges of those pillars are made straight and tend to meet in the middle line, the small gap between them being filled up by the uvula. The posterior nares are thus closed while the soft palate forms a concave roof guiding the bolus down the pharynx. The stylo-pharyngeus and palato-pharyngeus contract and bring that part of the pharynx to meet the food as it descends. Meanwhile the arytenoid cartilages and the vocal cords are approximated, the latter being also raised so that they come very near the ventricular bands. Magendie demonstrated that the larynx was tightly closed by muscular action at the instant of deglutition. It is also admitted that the cushion of the epiglottis covers the rima glottidis, while the epiglottis itself is depressed over the larynx. The thyroid cartilage is, by the action of the laryngeal muscles, suddenly raised behind the hyoid bone, and this assists the epiglottis to cover the glottis. The elevation of the larynx is so rapidly made that Boerhaave speaks of it as convulsive. Indeed, to render deglutition perfect, the larynx has to be raised with energy, with the mouth shut and the jaws in close contact. It is possible, especially with fluids, to swallow with mouth open, but it is very difficult and not without danger. The elephant, in consequence of the peculiar formation of his soft palate and larynx, has the privilege of breathing and swallowing at the same time; but with us we must close the larynx during deglutition and temporarily stop respiration.

The palato-glossi which lie in the anterior pillars of the fauces, by contracting, close the door behind the food which has passed them. It is acknowledged that the air-passages, the anterior fauces, the posterior nares, including the Eustachian tubes, and the larynx,

are all closed at the end of the second stage of deglutition. Deglutition is, as a whole, a reflex act. It can not take place until some stimulus be applied to the mucous membrane of the fauces. The center of this reflex movement lies in the medulla oblongata, higher up than that of respiration, so that swallowing may be arrested while the breathing is unimpeded. Notwithstanding all these facts are admitted, yet there exists great difference of opinion as to whether the epiglottis be essential to the protection of the larynx during the passage of food and drink. This is somewhat remarkable when we bear in mind that this cartilage has been for centuries under direct observation; that eminent physiologists have experimented upon the inferior animals, and the laryngoscope has been employed to gain definite ideas as to this point in physiology. This uncertainty of opinion has been caused by the contradictory results obtained by experiments.

Before relating the case which forms the basis of this paper, and which may contribute somewhat to the elucidation of this physiological inquiry, we shall give briefly the more important experimental researches as well as the pathological conditions of the epiglottis from which conclusions have heretofore been drawn. In ancient times it was almost universally believed that the epiglottis was a valve which completely guarded the entrance of the larynx from the passage of solid and liquid food. Aristotle defended this view against Hippocrates and Plato, who believed that portions of the fluid drank entered the larynx. Targioni, in 1772, reported cases in human subjects in whom the epiglottis was absent and where no inconvenience was experienced in deglutition. The first trustworthy experiments to test the rôle of the epiglottis as a protecting valve to the air-passages were made by Magendie, in 1813. He, having made an incision in the neck of a dog between the thyroid cartilage and the hyoid bone, drew out the entire epiglottis and extirpated it; and he found that the animals, after the operation, continued to swallow liquids and solids without difficulty, the act being very seldom followed by even a temporary cough. These results were obtained, he tells us, about an hour after the removal of the epiglottis. Subsequently, Magendie divided in dogs the superior and inferior laryngeal nerves, thus paralyzing the muscles of the glottis and leaving the epiglottis untouched. From this operation the deglutition of liquids, especially, became difficult, causing an irritative cough. Magendie's conclusion from these experiments was that the closure of the glottis itself protected the

larynx, and that the epiglottis had but little to do with it. These conclusions were generally accepted, although pathological cases in the human subject showed that the destruction of the epiglottis caused persistent difficulty in swallowing. This, however, Magendie, Merklen, and Bonnet explained by stating that in these cases the disease and the resulting disability were not confined to the epiglottis, but had extended lower down to the glottis and the surrounding textures. After reading over these original and able experiments of Magendie, I do not wonder that his conclusions should have remained unchallenged for twenty-eight years.

Longet,* in 1841, published his experiments of removing the epiglottis from six dogs. He reported that, if the animals were kept until the parts had completely healed over, cough, to a greater or less extent, followed the deglutition of liquids. This was the case in an animal kept for six months, in one that was killed on the thirtieth day, and in three that were killed on the nineteenth day. Post-mortem examinations showed that the extirpation of the epiglottis in these cases was complete. In one of the animals, killed two days after the operation, which had been able to swallow liquids without coughing, there was found a swelling at the base of the tongue which projected over the larynx, and acted in place of an epiglottis. Longet affirmed that Magendie's excisions had been incomplete and that his tests of the effects were made too soon after the operations. Longet concluded that the epiglottis did play an important part in deglutition, particularly of liquids. He accounts for the safe swallowing of solids by the fact that they slide over the base of the tongue, whereas the drops of fluid flow after deglutition along the base of the tongue and fall necessarily into the vestibule above the glottis, where they are expelled by a violent cough. He states, as the result of his investigations, that, when the glottis is prevented from closure, the epiglottis being intact, the deglutition of fluids is natural. He cites cases † to show that, when the glottis is prevented from closure, the epiglottis being left intact, the deglutition of fluids is not impaired; and experimentally he proved it by holding the glottis open by forceps introduced from below. Here we have two very important facts admitted by Longet, and subsequently by Walton—viz.: that while the epiglottis is intact and the glottis can not close, no difficulty follows; again, it has been

* "Archives générales," Paris, 1841, tome xii, page 418; et "Traité de physiologie," Paris, 1861, page 105.

† "Traité de physiologie," page 107.

shown by pathological cases and experiments that, when the epiglottis is wanting and at the same time the glottis can not close, difficulty in swallowing follows. The only conclusion to be drawn from these facts is that the epiglottis is able to close the larynx, and that it does so when the glottis fails to perform its duty.

Longet's experiments also showed that during the second period of deglutition the closure of the glottis was effected by the inferior constrictor muscles of the pharynx, all the intrinsic muscles of the larynx having been previously paralyzed. This was found to be the case also during vomiting and rumination.

Clinically we know that, even when tumors prevent the glottis from being closed, the epiglottis does protect the larynx. The fact, however, that while the glottis is in its normal condition liquids do not enter the larynx, whether the epiglottis is present or not, shows that the epiglottis under normal conditions is not absolutely necessary to protect the larynx.

It must be remembered that Magendie's and Longet's experiments were conducted before the discovery of the laryngoscope. This deprived their experiments of the exactness and accuracy which they would have had if the base of the epiglottis, and of the glottis with its cartilages, had been investigated by a bright laryngoscopic light.

Garcia in 1855, and afterward Czermak, had no difficulty through the open month in observing the slight tension and erection of the epiglottis in singing.

In 1859 Czermak studied, by aid of the laryngoscope, the physiological phenomena of the larynx, and says that when the larynx is raised and the vocal cords approach each other, the inferior part of the epiglottis is lowered and makes a cushion behind, and, that if the elevation continues, this cushion is placed in contact with the summit of the two arytenoid cartilages which are close together, and the orifice between the two ventricular bands is thereby closed. The cartilages of Wrisburg somewhat assist the closure and diminish to some extent the communication which exists at this point, during deglutition, between the pharynx and the region of the glottis. The epiglottic cushion sometimes fills imperfectly the interval between the ventricular bands and the arytenoid cartilages.

In 1865 M. Guinier * presented the French Academy the results of the experiments of Dr. Krishaber. They confirm Longet's views as to the passage of alimentary substances along one of the pharyn-

* "Gazette médicale de Paris," 1865, p. 435.

geal grooves by the side of the epiglottis, the bolus arriving at the œsophagus at the moment when, by the contraction of the constrictor muscles, the pharynx is shortened and brought in front of the mass.

M. Guinier observed by auto-laryngoscopy, when he performed the act of swallowing slowly and imperfectly, that the action of the epiglottis was not absolutely necessary to protect the larynx during the passage of the alimentary bolus from the pharynx to the œsophagus, and that the passage could be protected by simple closure of the vocal cords; and he further demonstrated that, in gargling, the space above the superior vocal cords was filled, and the liquid, agitated by the air, was allowed to pass slowly from the glottis.

In 1867 M. Moura * published his memoir on the functions of the epiglottis, studied with the laryngoscope. He states that he removed by curved scissors the epiglottis in three dogs, and that deglutition was not interfered with. The laryngoscope confirmed these results.

Moura says that the inferior third of the epiglottis is the only portion which directly contributes to the occlusion of the larynx during deglutition in the human subject. Consequently the two upper thirds can be destroyed or removed without materially interfering with the occlusion of the glottis. Moura reports that he has frequently verified Czermak's observations on himself and on others.

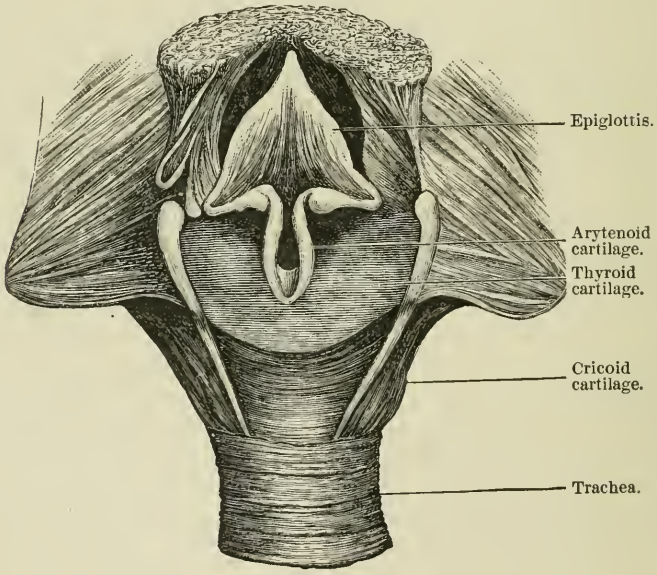
There can be no question but that the upper third of the epiglottis has a slight movement of bending over the glottis downward and backward, caused by the action of muscular fibers found in the thickness of the aryteno-epiglottic folds, but, as seen by Moura in his physiological experiments and vivisections with the aid of the laryngoscope, it does not act as a valve to protect the larynx. According to his results, it is the base of the tongue with the inferior third of the epiglottis connected with the glosso-epiglottic ligaments, together with the lower constrictor muscles, which protects the air-passage. It is thus seen that he differs from Magendie, who taught that this fibro-cartilage was indispensable neither for the safe swallowing of solids, nor of liquids, and from Longet, who taught that in deglutition of liquids it was necessary to protect the larynx. The epiglottis is frequently out of proportion to the size of the rima glottidis. Thus the different varieties of shape of the free portion of the epiglottis —such as the omega, the horse-shoe, the semicircle, the grand circle, and the truncated cone—mostly produced, according to Moura, some modifications in the mode of introduction of solids and drinks in the

* "Journal de l'anatomie et de la physiologie," Paris, 1867, page 157.

pharynx. By close examination of some of these, it is apparent from their shape that they can not, at their free edges, properly and of themselves completely cover the rima glottidis. I wish to call attention especially to the horse-shoe and the omega varieties.

Moura * further maintains that we can not draw correct conclusions as to the functions of the epiglottis in man from experiments upon dogs on account of the great difference in the anatomical formation of their larynxes.

He admits that the three dogs upon whom he operated ate and drank without difficulty except immediately after the operation. He also acknowledges that in the dog the epiglottis does act as a valve for the glottis, but that in the human subject it does not. I have here a larynx of a dog to show the difference of its formation from that of man. The epiglottis of the dog has not the same curves as in man; it resembles the superior jaw of young birds just out of their shell; it is loosely joined to the tongue; it can be displaced,



pushed down, or carried from right to left with great ease, and its borders, in a state of repose, touch the wall of the pharynx. Moura demonstrated that the bolus of food, in passing over the epiglottis

* *Loc. cit.*

of a dog, upturned it to such an extent that its angle or its superior point became the lower and pushed against the pharynx, and that it regained its normal position after swallowing the alimentary food. Its walls are like thin paper, so that in vivisection on the dog, to get a clear view of the larynx after pulling the tongue out as far as possible, it is necessary to draw out the epiglottis with a pair of forceps. The closing of the larynx showed also an essential difference. The ventricular bands in the dog come easily and readily in contact and close the cavity of the larynx perfectly. In the human subject the most energetic effort is never able in the normal state to produce the contact of the ventricular bands, the thyro-epiglottic ligament being indispensable to fill the space which separates the two sets of bands at the moment of deglutition. The occlusion of the larynx can be accomplished in the dog by the contact of the ventricular bands, in the human being by the thyro-epiglottic ligament and the inferior third of the epiglottis. We can understand from these facts that, while the destruction or complete extirpation of the epiglottis impedes in no degree the function of deglutition in the dog, yet it may make it very difficult in man. The difference is, that in the dog the whole of the epiglottis is not necessary to the integrity of the function, in the human, however, the lower third is necessary. He therefore claims that the experiments of Magendie, Longet, and Walton on dogs, in regard to the functions of the epiglottis, are not conclusive in their application to man.

G. L. Walton,* in 1878, published six experiments upon dogs and cats. He excised the upper or valvular part of the epiglottis and found that the entire epiglottis could be removed from those animals with impunity as far as the protection of the air-passages was involved, neither solids nor fluids entering them after the operation. He concluded that Longet, in his care to remove the whole epiglottis, had cut away some of the essential parts of the lips of the glottis, thus preventing its complete closure. Longet had set aside Magendie's experiments under the supposition that his operations were incomplete. To show how Longet could have made the mistake, Walton removed in a dog the entire epiglottis and enough of the lips of the glottis to prevent its perfect closure, with the results of allowing food to enter the larynx at every act of deglutition. Walton did not use the laryngoscope.

Let us now see how far pathological observations confirm or disprove these physiological experiments. Numerous cases have been

* "Journal of Physiology," vol. i, p. 303.

reported where the epiglottis has been destroyed by disease or by wounds. We all daily meet with cases in which the epiglottis has been destroyed by ulceration, from syphilis, and from tubercular disease. They are frequently the most unpleasant cases to deal with, from the fact that deglutition is not only exquisitely painful, but because the rima glottidis is imperfectly closed, and convulsive coughs result from the swallowing of food of any kind. Many persons have literally died from inanition under these circumstances. Now, through alimentation by means of small œsophageal tubes and the local applications of cocaine, such conditions are made more tolerable. In these cases the writer has frequently found that the inflammatory thickening extended, with ulcerations, to the ary-epiglottidean folds, the false or true vocal cords, or to the arytenoid commissure.

I find in the older writers—such as Haller, Pelletan, Reichel, Sachse, Rudolphi, and Louis—pathological cases mentioned, but their testimony is impaired by their inability to state the condition of the other parts of the laryngeal connections.

Unless the ulcerations are limited to the valvular, the free portion of the epiglottis, they prove nothing as to its function. This is true of wounds of the epiglottis. Unless this fibro-cartilage be the only part injured, it can not be held responsible for the impairment of the function of deglutition.

Magendie* stated that he knew two individuals in whom the epiglottis was entirely wanting, and deglutition was performed without any difficulty. He further states that in laryngeal phthisis, where there was destruction of the epiglottis, deglutition was labored and imperfect, because the arytenoid cartilages were destroyed, and the borders of the glottis were ulcerated to such a degree that it was impossible to accurately close the glottis at the moment the substance passed that opening. In the two cases related by Baron Larrey—that of General Murat, a soldier—the whole epiglottis was shot off at the base of the tongue. There was persistent difficulty in deglutition, and also loss of articulated speech. This showed that there was some injury of the vocal cords or of the adductor muscles, below the epiglottis. Walton looked through many reports of cases of diseased larynxes in search of one in which the fact could be clearly shown that the lesion was limited to the epiglottis and where liquids penetrated the larynx. No such case is found in a careful search through reports of Turck, Burow, Mandel, Ryland, Czermak,

* "Physiologie précis elementaire," 1836.

or Morrell Mackenzie. In a case reported by Czermak,* where the painful and difficult deglutition was supposed to be due to the epiglottis, there was extensive ulceration of the glottis. Many cases are found reported by Burow,† Norton,‡ Turck,# and Ravere,‖ where there was partial or complete loss of epiglottis, but no liquid passed into the larynx producing cough. It must be borne in mind that there may be dysphagia and pain in swallowing from soreness of the epiglottis without any entrance of food into the larynx; when this last condition occurs, it is in consequence of the entrance of fluid or solid food. In a case mentioned by Austin Flint, Jr., of entire loss of the epiglottis as shown by the laryngoscope, the patient experienced slight difficulty in swallowing, from the passage of little particles in the larynx. In this case the absence of the epiglottis exposed to a good view the air-passages in deglutition. In a few days the act of deglutition was performed with a certain deliberation, but without difficulty. Deglutition was accomplished most easily in the recumbent posture. One of the most remarkable pathological cases was reported by Dr. Enos ("Amer. Med. Monthly," vol. xv, p. 272), where there had been no difficulty in the swallowing of either solid or liquid food, yet at the post-mortem examination the epiglottis was found entirely destroyed by ulceration; the epiglottidean folds were wanting; the vocal cords and the arytenoid cartilages had been so changed by the disease as to greatly diminish the area of the rima glottidis, and there was aphonia. The difficulty of studying, by the application of the laryngoscope, the process of deglutition is certainly very great. The writer frankly acknowledges that he has found it utterly unsatisfactory. The movements of the first period of deglutition are under the control of the will and are generally involuntary, but the second period involves more complex movements, and, being reflex, are beyond the control of the will. During this process the jaws are closed. It is a very difficult matter to swallow even when the jaws are very slightly separated. It must require great skill in the use of the laryngoscope and great forbearance on the part of the patient. It is questionable whether, the natural process being so much interfered with, it is a correct mode of studying it.

* "Czermak," translated by Gibb, London, p. 57.

† "Laryngoscopieal Atlas," 1877.

‡ "Affections of the Throat and Larynx," London, 1857.

Turck, "Krankheiten des Kehlkopfes."

‖ "Human Physiology," by A. Flint, Jr.

J. W., aged twenty-two, a farmer by occupation, five feet eight inches in height, weighing one hundred and fifty-six pounds, from early in life had had some trouble in swallowing which appears to have been congenital. He had suffered during infancy with trivial infantile diseases, but had never had any serious disease, either zymotic or inflammatory. His family were aware that he had some trouble in his throat, causing him to strangle readily during his meals; frequently at that time he would get fluids into his larynx and have severe coughing spells, yet if he was deliberate in swallowing he suffered no inconvenience. When in a hurry he felt that the particles of food lodged in his larynx, but he could by a slight effort throw them up into the pharynx, and swallow them. By the aid of the laryngoscope I had a full view of his larynx; the epiglottis was almost entirely wanting; the free border and the cushion were absent. All that was left was a rounded border connected by the glosso-epiglottidean ligaments to the base of the tongue. This looked like a ridge at the extreme end of the tongue. The arytenoid epiglottidean fold seemed normal, but the ventricular bands were hypertrophied, and the mucous membrane over the vocal cords was much thickened and of a dull color. I made efforts to look into the larynx during deglutition, but did not succeed. I gave him a piece of dry bread, and, after thoroughly masticating it, he swallowed it hurriedly. He motioned to me to inspect his larynx with the laryngoscope. I did so, and found the space above the vocal cords completely filled by the bread. On withdrawing the mirror, the patient, by a slight effort, raised the bread from the larynx and pushed it down the œsophagus. After a very careful inspection I could detect nothing unnatural in any other part of the larynx. The arytenoid commissure, and the cartilages of Wrisburg and Santorina, with their connections, were perfectly normal.

Here was a congenital absence of the epiglottis without other appreciable defect in any other part of the larynx—such a case as Walton searched for in vain among the authorities. There was not only difficulty in swallowing, but passage of the food into the larynx, in consequence solely of a deficient epiglottis. The complete arrest of the food in the glottis by the exact closure of the vocal cords alone prevented the mass from passing into the trachea. In this case, at least, the absence of the epiglottis interfered with the integrity of deglutition. Such was also the condition in the case reported by Flint. Slow, cautious deglutition in both cases enabled the patients to swallow without getting food into the larynx, but in hurried efforts it did enter that organ.

After a careful review of the whole subject as presented in this paper, the author feels justified in making the following conclusions:

1. That the epiglottis is not a valueless appendix to the mechanism

of deglutition in the human subject, but that it is one of the agents for protecting the larynx from the entrance of food and drink.

2. That ordinarily the lowest third of the epiglottis is the only portion which is needed for this function.

3. That the other effective agents for the protection of the air-passages are the upward movement of the larynx in front combined with that of the tongue behind, the occlusion of the glottis, the exquisite sensibility of the mucous membrane of the upper glottic space, and exceptionally the lower constrictor muscles of the pharynx.

4. All these different portions of the pharynx are protective of the larynx to a greater or less degree, and it is difficult to assign to any one of them a position of greatest prominence. They ordinarily act together in protecting the larynx from the dangers connected with deglutition. In instances of disability of one or more of them, the others supplement their action.

Bibliography.

Targioni Tozzetti (G.). "Trans. rec. period. d'obs. de méd.," Paris, 1756.

Magendie. "Mémoire sur l'usage de l'épiglotte," etc., Paris, 1813.

Magendie. "Précis élémentaire de physiologie," Paris, 1836.

Magendie. "Cyclopædia of Anat. and Phys.," vol. iii, 1847.

Haller. "Elementa physiologie," t. iv, Bernae, 1764.

Longet. "Recherches expérimentales sur le fonction de l'épiglotte," 1841.

Longet. "Recherches experimentales sur le fonction de l'épiglotte," etc. "Arch. gén.," t. xii, 1841.

Longet. "Traité de physiologie," t. i, Paris, 1861.

Beclard. "Traité élémentaire de physiologie," 7th edition, 1880.

Enos. "Amer. Med. Monthly," vol. xv, 1861.

Reichel. "De usu epiglottidis," Berolini, 1816.

Green (H.). "Lesions of the Epiglottic Cartilage," "Am. Med. Jour.," viii, 1857.

Beigel. "Two Cases of Loss of Epiglottis," "Lancet," London, 1868.

Porter (W.). "Excision of Epiglottis," "Am. Jour. Med. Science," 1879.

Walton (G. L.). "The Function of the Epiglottis in Deglutition," etc., "Jour. Phys.," London, 1878, vol. i.

Foster. "Text-book of Physiology," Edition 1883, London.

Gerdy (M.). "Dict. de médecine," Paris, 1835; article, "Digestion."

Albinus. "De deglutitione," 1740, Paris.

Maissiat (J. H.). Thèse de Paris, 1838.

Debrou (T.). Thèse de Paris, 1841.

Flint, Austin, Jr. "Physiology of Man," vol. ii, art., "Digestion," New York, 1874.

Fiaux (Louis). "Recherches expérimentales sur mec. de la déglutition," Paris, 1875.

Second Day, Morning Session.

BUSINESS MEETING.

The meeting was called to order by the President at ten o'clock, and the reports of officers and committees presented as follows:

Secretary's Report.—The minutes of the last regular meeting, together with those of the Council for 1885–'86, were read by the Secretary, who presented as his official report the Seventh Annual Volume of the Transactions of the Association.

The Secretary also reported that a proposition had been offered to renew the arrangement made as before with the editor of the "New York Medical Journal" for the publication of the Transactions.

The report, including the proposition of Dr. Foster, was unanimously adopted.

Report of the Treasurer.—The Treasurer, D. Bryson Delavan, reported that the receipts for the year 1885–'86 had amounted to $278.03, but that, owing to several unusual expenditures on the part of the Association, several bills against it remained unpaid.

The Auditing Committee made the following report:

Your committee have examined the bills and accounts of the Treasurer and have found them correct.

Respectfully submitted,

E. L. Shurly,
F. H. Hooper,
C. E. Sajous.

It was moved by the Treasurer that an assessment of $2 be levied upon the Association to meet the outstanding accounts. Carried.

Report of the Librarian, 1886.—It is with great pleasure that the Librarian finds himself able to report a prosperous condition of the department under his charge. During the past year numerous donations have been made to the library. At the last meeting of the Association

the catalogue of the library, which was presented with the librarian's report, was ordered to be printed, together with 150 interleaved copies for distribution. The catalogue, including all contributions made prior to March 1st of this year, appeared in the last Transactions. An interleaved copy in pamphlet form has been sent to every Fellow of the Association, to most of the contributors, and to many others known to be interested in laryngology. It is believed that the printed catalogue will serve to stimulate greater interest in and larger contributions to the library, and, to the end that the donations shall continue, and the Fellows and others may be kept familiar with the contents of the library, the librarian respectfully suggests that a list of the contributions received each year shall be published in the Transactions, and that a number of interleaved copies of the same shall be printed for distribution outside of the membership of the Association.

As may be seen by referring to the catalogue, some of the Fellows of the Association have not yet contributed any of their writings, and the lists of others have not been made complete. It is to be hoped that these deficiencies will be supplied in the near future. If every Fellow would place the address of the librarian on the list he uses when distributing reprints, the accessions would be larger than they are at present, for the library is now often overlooked.

The library is arranged in alphabetical order, in a case set apart for its use, at the office of the librarian. An impression of a stamp, consisting of a circle inclosing the words "American Laryngological Association Library," has been placed upon each piece.

The librarian desires instructions regarding the loaning of books and pamphlets, and the length of time which each can be retained.

Respectfully submitted,

THOMAS R. FRENCH, *Librarian.*

Dr. Daly moved that the report of the Librarian just read be received and filed, and the thanks of the Association be tendered to the Librarian for his efficient and auspicious management. Carried.

Committee on Nominations.—The Committee on Nominations reported as follows:

For President.—Dr. E. Fletcher Ingalls, Chicago.

For First Vice-President.—Dr. Ethelbert Carroll Morgan, Washington.

For Second Vice-President.—Dr. John N. Mackenzie, Baltimore.

For Secretary and Treasurer.—Dr. D. Bryson Delavan, New York.

For Librarian.—Dr. Thomas R. French, Brooklyn.

For Member of Council.—Dr. Franklin H. Hooper, Boston.

Place of next meeting, Chicago, Ill., the first Thursday in June, 1887.

T. R. FRENCH,
[*Signed*] F. I. KNIGHT,
G. W. MAJOR,
Committee on Nominations.

It was moved by Dr. J. Solis-Cohen that the President and Secretary be instructed to supply any Fellow going abroad with a certificate entitling him to represent the American Laryngological Association at any scientific body whose sessions he may attend. Carried.

On motion of Dr. Asch, the vote of the Association of last year upon the amendment concerning election of Fellows was reconsidered.

After some discussion, Dr. Seiler withdrew the amendments which he had proposed last year.

A communication from the American Surgical Association was presented by the Secretary, asking for the appointment of a committee to confer with delegates from other societies, with reference to the advisability of forming an association of American physicians and surgeons, to hold its meetings in the city of Washington.

The Secretary read the communication, and also a favorable recommendation from the Council.

Dr. Hartman moved that the recommendation of the Council be accepted, and that the Chair appoint a committee as advised.

This was adopted, and the President appointed the following ex-presidents of the Association, in the order of seniority, directing them to form their own organization: J. Solis-Cohen, G. M. Lefferts, F. I. Knight, F. H. Bosworth, and E. L. Shurly, as the Committee on Conference.

The Secretary asked for instructions with regard to publishing the Proceedings of the Council in the annual Transactions.

On motion of Dr. Knight the matter was referred to the Council, with directions to publish its Proceedings complete, or in part, as it thought best.

Dr. Daly moved that the Sections 7 and 9 of the By-Laws be construed to mean that a member may *either* attend the meeting or furnish a paper for the Transactions.

Dr. Hartman moved that the subject be referred to the Council for decision. Adopted.

The Secretary read a telegram from London addressed to Dr. G. M. Lefferts. On motion of Dr. Knight the subject was referred to the Council.

A motion offered by Dr. Bosworth that the Association proceed to the election of corresponding Fellows was decided out of order.

Executive session adjourned.

Paper.

OBSERVATIONS ON THE USE OF SOME OF THE NEWER REMEDIES IN DISEASES OF THE UPPER AIR-PASSAGES.

By E. L. SHURLY, M. D.

THERE is, perhaps, no department of medical science which has enlisted more interest during the last few years than that of therapeutics, and it ought to awaken in us the strongest feelings of pride and encouragement to see the mist of empiricism which has for so many ages obscured this field gradually dissipating before the light of scientific progress. The results already obtained have been, in great measure, due to the aid which chemistry and physiology have furnished clinical medicine, the former by resolving drugs into their proximate principles, and the latter by pointing out the effects of these upon the tissues and functions of the healthy economy. Now, no department of practical medicine, it seems to me, stands more in need of scientific guidance for its therapeutics than laryngology; for the selection of applications, with few exceptions, depends more upon individual experience and experiment, or empiricism, than scientific principles. Therefore, it would seem that we ought to rigidly study the proximate and remote effects of the application of medicinal agents to the air-passages, and their influence in relation to systemic treatment of various sorts, in the hope of evolving with certainty the hidden facts regarding the relationship between the condition of the part and the absolute effect of the medicament. Pursuant to this line of thought I have, for the past eighteen months or so, been studying the effects of some of the alkaloids and glucosides when used topically. I do not present these observations as conclusive, only with a view of eliciting interest and discussion. I shall omit the general therapy of these drugs, of course, referring to some effects only.

Aconitine.—I have records of twenty-five cases in which it was used either in the form of a spray or pigment. Two were cases of laryngeal phthisis; seven of chronic pharyngitis—in five of which there existed acute exacerbation; eight of acute pharyngo-laryngitis; three of chronic follicular amygdalitis; three of chronic laryngitis; and two of pharyngeal neuralgia. The amount used each time varied from $\frac{1}{480}$ to $\frac{1}{150}$ of a grain. In each instance there occurred in a few minutes the well-known physiological effects of tingling of the tongue and feeling of choking and numbness, to which was super-

added, when applied in the nasal fossæ, lacrymation, with sneezing and vertigo. On two occasions these local symptoms were very severe and distressing to witness.

Only once did I observe a marked effect on the pulse immediately after the application. With a small dose— $\frac{1}{480}$ grain—these symptoms passed away in about two hours; with the larger doses from four to six hours elapsed before the patient became comfortable.

As to the local effect, in every case there arose in a very short time, almost immediately, an active hyperæmia. Even in the case of phthisis the pale color was deepened to a vivid rose, or a near approach to it. The ulterior effect was, in the acute cases, to cut short the course of local inflammation; in the cases of chronic pharyngitis, etc., there was no permanent effect, the cases of pharyngeal neuralgia—severe paroxysmal pain on one or other side of the pharynx—occurring in a pregnant woman, and a woman suffering with supposed chronic inflammation of the ovary respectively. The application of the pigment with a brush twice daily produced immediate and marked relief, although not a cure.

From these observations, therefore, I think that this agent as a local application was of little benefit, except in a few particular cases, while its very unpleasant effect upon the sensations of the patient was entirely out of proportion to its therapeutic value.

Agaricin (a glucoside from the *Boletus laricis*).—From the good effects in the abatement of nocturnal sweating, which I have observed from the administration of this agent, I was led to use it topically in a few cases of chronic nasal and pharyngeal disease, but, as I did not observe any physical or therapeutic effect, I have nothing to report at present.

Arbor Vitæ.—On account of its reputed efficacy in causing the disappearance of syphilitic warts, I was led to use this drug as an application to intra-laryngeal papillomata. In one case, that of a boy fourteen years of age, who was suffering with a progressive growth of these tumors on the vocal cords and ventricular bands, it certainly acted remarkably well. Only one of the growths—the largest—was removed by the forceps, the others disappearing under the use of a spray of the aqueous extract, applied once or twice daily, for a period of about three months. Perhaps some of the gentlemen will remember having seen this patient in my office during the time of the last meeting of this association in Detroit; if so, you will remember that we all concluded that, on account of the imminent prospect of suffocation, tracheotomy would soon be neces-

sary. There is not a vestige of a neoplasm in his larynx now. I will add that a renewal of the growths took place in February, but speedily disappeared again under this treatment.

In another case, in an adult, where there were five papillomata in the region of the anterior commissure of the vocal cords, this remedy only partially succeeded, the forceps having been resorted to for the larger ones. The treatment, however, seemed to prevent their renewed growth.

In still another case, one of cystic tumor of the right vocal cord, the arbor vitæ has had no effect whatever, unless, perhaps, to suppress catarrhal inflammation. Whether this action of the drug is due to any specific property, or simply its astringent property, I do not know. I am aware that there are cases on record of like results following the use of tannic acid, but in my experience I can remember only one case of this kind where the application of tannic acid seemed to take any part in the dissipation of the growth.

I have also used arbor vitæ in the local treatment of some cases of chronic laryngitis with benefit.

In preparing the fluid extract for spray, to render it unirritating, it will be necessary to drive off nearly all the alcohol by means of heat, boiling it down to a syrupy consistence, and afterward add water to the amount of one third to one half of the amount distilled off, then filter.

Ammonium Glycyrrhizate.—As a spray I have obtained no particular effects. I have prescribed it for a large number of cases of acute and chronic bronchial catarrh, in doses ranging between two and five grains. In the chronic cases it seemed inferior to ammonium chloride and ammonium iodide, but in the acute uncomplicated cases it has proved itself a valuable expectorant.

Cannabine Tannate (from *Cannabis indica*).—On account of the difficulty of making a solution of this substance, I have used it mostly in the form of powder mixed with starch, or in the form of an ointment with vaseline. I have used it in about fifty different cases, sixteen of which I have notes of, and a majority of these were cases of nasal or naso-pharyngeal disease. It possesses astringent properties, and is also a decided local stimulant. When applied undiluted to the nasal mucous membrane it causes considerable irritation, which lasts for a period of two to four hours, producing lacrymation and swelling of the turbinated mucous membrane. But when applied diluted with starch in the proportion of two to five grains to the drachm, or with vaseline in like proportion, it has, as a rule, no

such irritation, but a decided astringent, and afterward soothing effect. It has proved a valuable agent, according to my experience, as a substitute for tannic acid, which latter I have ceased to use in the nasal chambers on account of its irritating effect; with children suffering from swelling of the nasal mucous membrane, either acute or subacute, it will prove an excellent and efficient application, especially when mixed with vaseline.

Cadmium Sulphate.—This salt, which has been highly extolled as an astringent, I believe is not superior to sulphate or chloride of zinc. I have used it as a spray and pigment in about thirty cases, in the proportion of from one half to five grains to the ounce, and have noted no particularly beneficial result over zinc sulphate and chloride or silver nitrate, excepting in one case where the unpleasant results following the application of any solution of silver nitrate forbade its use. The cadmium certainly acted well, and seemed to bring about the desired result.

Cotoin (the active principle of coto bark).—Although there is not much literature upon this subject, it is reputed to be a good remedy for chronic diarrhœa and the diarrhœa of phthisis. I have administered it in two cases of diarrhœa of phthisis, but without signal success. I have used it locally in about twenty cases of nasal and pharyngeal disease, twelve of which I have notes of. It is a powerful irritant to the nasal and pharyngeal mucous membrane—both healthy and diseased—and leaves no reactionary effect. Its best effects are obtained in cases of atrophic nasal and pharyngeal catarrh, and, when diluted in starch or sugar in the proportion of one part to three or four of excipient, it is, I think, quite equal if not superior to any other application—excepting galvanism.

Coniine Hydrochlorate (a salt of the alkaloid of *Conium maculatum*).—From the well-known selective action of conium on the muscular system and sympathetic nerve, one would suppose that this alkaloid—readily diffusible as it is—would act signally as a corrective in those local disorders of the throat and larynx characterized either by co-ordinate or ordinate spasm, etc.

I have notes of ten cases representing various spasmodic actions of a pathological nature of the pharynx and larynx, one of which was an hysterical laryngeal cough, and one a local chorea, in which I applied this agent repeatedly in progressive doses (both by means of spray and pigment) without any sensible result in modifying the diseased action. I am therefore disposed to regard it as wanting in value for a local medicament.

Cocaine.—As medical literature is already surfeited with items regarding this remarkable drug, I will spare your feelings and pass it by.

Daturine (an alkaloid from *Datura stramonium*).—From the known value of stramonium as an anti-spasmodic, and its especial utility in the relief of spasmodic asthma, I was led to give this alkaloid a thorough trial as a topical remedy in affections of this sort.

I have notes of twenty-three cases subjected to experiment, as follows: 1, bronchial asthma; 1, spasmodic asthma; 2, periodic laryngeal congestion; 3, hay fever; 1, chronic bronchitis (bronchorrhœa); 3, hysterical pharyngeal catarrh; 5, influenza; 1, laryngismus (with ovarian disease); 2, chronic naso-pharyngeal catarrh; 2, acute coryza; 2, chronic laryngitis.

The dose varied from $\frac{1}{100}$ to $\frac{1}{50}$ of a grain, and in some of the cases was repeated two, three, or four times a day; in each case, when the dose was large enough or frequently enough repeated, there appeared to the patient sooner or later the characteristic sensation of dryness of the fauces, etc. The patients with asthma were not sensibly affected by the treatment; two of those with hay fever were very much benefited by the applications if repeated often enough (it was used in the form of spray), but the trouble was not arrested; three of those with influenza were decidedly relieved by three applications daily of a spray ($\frac{1}{100}$ of a grain), while the two others were not at all relieved. The neurotic cases were only relieved by a diminution of secretion, which, however, lasted but a few hours, necessitating a repetition of the dose. In the other cases I could observe no particular effects.

Ethyl Bromide.—This has been used almost entirely as an inhalation for the relief of cough. I have tried it in a large number of cases; it is not quite so efficacious as chloroform, but there is much less general anæsthesia from its continued use, and it leaves no unpleasant after-effects. I think, therefore, that it is deserving of more extended use for the relief of severe dry cough and spasmodic asthma.

Hyoscyine.—The hydrobromate is the salt which has been used. I have been unable to note any marked effect, proximate or remote, from the local use of this salt—excepting in a few cases there arose a sensation of dryness which passed off in about an hour.

It produces no apparent change in the condition of the mucous membrane to which it is applied. The doses used varied from $\frac{1}{400}$ to $\frac{1}{150}$ of a grain.

Hydrastine (alkaloid from *Hydrastis canadensis*).—I have had but a limited experience with this drug, for, seeing no particular effects, and hearing such *bitter* complaints from those to whom I had applied it, I soon abandoned its further employment.

Iodol.—I have used iodol in a few cases of ulceration of the mucous membrane, both specific and ordinary, and observed that it has nothing like the power to arrest the ulcerative process which iodoform possesses, although I can not say but that slow improvement and healing followed its use. It is sincerely to be hoped that this substance will prove to be a capable substitute for iodoform, because it is free from odor and causes no bad taste. I have always applied it by insufflation.

Papain (papaw juice).—In one case of diphtheria I applied the fresh juice, and in six other cases it was used in the form of a glycerole—either one half or two thirds strength; but no solvent action was observed on the exudate in any case. I may add that this was the experience of two other practitioners in our city, who also tried the remedy in cases of diphtheria. Therefore, so far as this limited experience goes, it has utterly failed to sustain its reputation as a remedy for the relief of real diphtheria.

Muscarine Sulphate (alkaloid of *Agaricus muscarius*).—Very little is known about this drug, but it is said to resemble in its physiological action that of physostigmine. I have applied it in doses of from $\frac{1}{50}$ to $\frac{1}{10}$ of a grain in twelve cases characterized by dryness of fauces and larynx, without any result excepting in two. One of these patients presented signs of great dryness of the fauces, and lack of buccal and salivary secretion, accompanying general nervous prostration; and the other had "dry catarrh" of the pharynx and larynx. In both of these cases a spray, repeated three or four times a day, seemed to afford great relief. The immediate effect was a pleasant tingling sensation, soon followed by comfortable heat and more secretion. No effect on the pupil was observed. In the other cases no immediate or remote effects, either objective or subjective, could be observed.

Physostigmine Salicylate.—This was thoroughly tried in a number of instances, of which I have six recorded. In but one instance did it produce any physiological action, or in any obvious way relieve the pathological condition of the parts. This case was that of a delicate young man who had from time to time suffered from spasmodic stricture of the lower pharynx and œsophagus; he experienced almost immediate relief from an application of $\frac{1}{250}$ of a grain, which

lasted about six hours, when another application became necessary. At the end of forty-eight hours the attack ceased. Nothing which I had ever used locally in this man's case had acted so well as this agent in cutting short the course of the attacks.

Pilocarpine Hydrochloride.—I have five recorded cases of pharyngeal catarrh characterized by a sensation of dryness and consequent distress in which I have tried this remedy, in doses varying from $\frac{1}{20}$ to $\frac{1}{4}$ of a grain, but without any positive result.

Piscidin (a glucoside from *Piscidia erythrina*).—I have nine cases recorded in which this was used either as spray or pigment, in doses ranging from $\frac{1}{480}$ to $\frac{1}{24}$ of a grain. In only one instance could there be observed any proximate or remote effect, and that was a case of phthisis characterized by a very persistent and aggravated sensation of tickling referred to the pharynx. In this subject the application of a pigment in the proportion of $\frac{1}{120}$ of a grain to the drachm, every two or four hours, seemed to relieve the trouble in two days.

Resorcin.—Although attention was first called to this agent in 1860, when it was presented as a supposed substitute for carbolic acid, yet medical literature does not show that it has been at all extensively used until very recently. I have used it considerably during the past year, and believe it to be an important addition to the pharmacopœia. It is practically odorless and tasteless, while it is soluble in water; it is very feebly caustic, and, although a weak, still an efficient antiseptic. I have the records of thirteen cases in detail in which resorcin was used with good effect. Three were secondary syphilitic ulceration; one, tertiary; six, ozæna—of which one was an aggravated case where the turbinated bones had disappeared; one, eczematous lupus of nose and pharynx; one, ulcerating and eczematous lupus; and one, typical herpetic pharyngitis.

The case of ulcerating lupus needs some additional remarks, inasmuch as it was a peculiar one; the subject, a child nine years old, had been suffering for nine months; first, with an obstruction of the nasal passages and an irritating discharge therefrom, followed gradually by the growth of fungous granulations in these passages and about the edges of the nares and upon the roof of the mouth, about the center of the hard palate. When I saw her in February, 1886, there were extensive ulcerating granulations in the nasal passages and upon the surface of the roof of the mouth as well as at the margins of the nares; the nasal column was also ulcerated and its cartilage denuded. The patient's general condition was also much below par. Having anæsthetized her, I destroyed with the galvano-

cautery all the fungous tissue that I could reach and applied iodoform thoroughly. The iodoform was applied for several days, as was also resorcin (in the proportion of one to four and one to six), but the main treatment afterward consisted of resorcin used as a spray or pigment. The galvano-cautery was applied to two small spots in the mouth once since, but otherwise the treatment has consisted of the application of resorcin (and vaseline to moisten the parts) every day, conjoined, of course, with a recuperative and tonic plan of treatment. I saw the patient last on the fifth of this month (May), and observed that she was in good health, with very little deformity about the nose, and no reappearance of the trouble excepting at a spot situated on the inside of the cartilaginous nasal column. She is still under treatment. In the cases of ozæna, especially the one with the loss of the turbinated bones, the effects of this agent, used once or twice daily, as spray, were quite prompt, and it seems to me remarkable. The patient was under treatment about five weeks. I saw him about two weeks ago, and he told me that he was comparatively free from trouble, and had been for the last three months; he uses a douche every day (as might be expected) of salt and water. Has no pain now and no more discomfort than is usual for ever after such a lesion. The ulcerative process is apparently checked.

Sanguinarine Nitrate (a salt of the alkaloid of *Sanguinaria canadensis*).—No special results follow the local use of this drug, but for internal administration in a certain class of cases it is highly useful as a stimulating expectorant. I have noticed no unpleasant effects or depression from it in doses of $\frac{1}{10}$ to $\frac{1}{4}$ of a grain in syrup. I regret that the time allotted to this paper necessitates the omission of many important details connected with the study of these agents, but hope this imperfect and compressed report, as it were, may serve the purpose of inducing some of the gentlemen present to take the subject up for particular clinical study.

I trust that I may be able next year to add something further of interest in this line of work.

Discussion.

Dr. Major.—Having been in the habit of using aconite in the form of spray in the treatment of inflammation of the upper air-passages, I have noticed that the effect of the drug is more marked and more rapid than when used for the bronchial mucous membrane. In one case I was using a solution containing four or five minims in the form of a spray, when the patient became pallid and depressed and presented the usual appearances of aconite poisoning. Although I use it constantly and consider it a spe-

cific, especially at the outset, yet I wish to call attention to the increased effect of aconite when it reaches the system by the way of the respiratory passages.

Dr. Mackenzie.—I think the same rule will apply to most drugs when administered by way of the respiratory passages, and therefore would regard the application of powerful drugs like aconite in spray as rather a hazardous procedure. I have made some experiments during the last four or five months with the dioxide of hydrogen in chronic suppurative catarrh of the nose, larynx, and pharynx by internal administration. I commenced its use in old cases which had resisted almost all kinds of treatment, internal and local. The success was such as to warrant me in continuing the trial. I used a four-per-cent. solution. I first commenced with a six-per-cent. solution, but afterward reduced it to four, which keeps better. The usual dose is two or three drachms of the four-per-cent. solution, to be taken three or four times a day, keeping it up for a few weeks. In a fair proportion of cases the discharge was certainly arrested by this means alone. In two cases the result was very marked, and in others the discharge was very much reduced.

Dr. S. Solis-Cohen.—I have been much interested in Dr. Mackenzie's remarks concerning hydrogen dioxide. I have not used it internally in catarrhal cases, but I have seen good results from its administration in phthisis, as originally recommended years ago by Dr. Benjamin Ward Richardson. I usually give a drachm of a ten-per-cent. solution very much diluted. It generally seems to agree with the patient and to improve nutrition. Its use is frequently attended with a notable reduction in the pulse rate, a phenomenon I have not seen mentioned in the text-books or in special articles on this drug. In one case this became so marked that I was obliged to discontinue its use. Further than this, I only noticed the best results in improvement in the general condition; and in cleansing, if I may use the term, the secretions from the larynx, I have used aconite and have seen no bad results from its use. I employ it, however, in the form of the oleate as reported to the association last year, and not as a spray. In this form we are more likely to obtain maximum local effect with minimum constitutional disturbance. I apply it with a brush or a wad of cotton; a two-per-cent. solution in oleic acid. After three years' experience, I can say that it certainly reduces inflammation and subdues pain. In some instances it answers better -caine. The effects are more lasting. Some patients complain of its taste, others say it is rather agreeable. Ethyl iodide by inhalation is useful to control fœtid secretions, and may sometimes be used as a substitute for iodoform. It has proved useful in fœtid rhinitis, syphilitic and non-syphilitic. While on my part I would like to recall attention to the advantages of an old method of administering the recent vapor of ammonium chloride, the method of Lewin, in which the patient inhales the vapors arising from the mingling of the vapors of hydrochloric acid and of ammonia, I have seen remarkable effects from its use in old cases o

fœtid catarrh. In order to remove the irritating qualities, the vapor should be washed twice; in the second wash-bottle I sometimes place a little terebene or thymol. This makes the vapor rather pleasing, and possibly adds to the therapeutic efficacy. The thymol alone has, however, failed to produce any decided results.

Dr. Morgan.—In regard to aconite and its various preparations, when employed therapeutically in the upper air-passages, my experience had been both extensive and thoroughly satisfactory. For years I have made use of the tincture of aconite-root—in the form of spray, gargarism, pigment, etc.—in treating acute and subacute inflammatory diseases of the nares, pharynx, larynx, and trachea. Aconite, I believe, has a direct and local specific effect upon the respiratory mucous membrane, and, if cautiously and judiciously applied, is invaluable to the laryngologist.

I have long noticed that a spray of tincture of aconite-root, one to one hundred of water, is absorbed by the bronchial mucous membrane with wonderful celerity, and both the local and general effects of the drug become well marked in a few seconds. Aconite, apparently, acts much more rapidly than other drugs when brought in contact with the respiratory membrane. For irritative cough arising from nasal, pharyngeal, laryngeal, tracheal, or even bronchial hyperæmia, a spray of the tincture of aconite-root, ♏ x to f ʒ iv of water, is followed by the greatest relief.

I have, however, seen all those physiological phenomena of aconite, so beautifully portrayed by Dr. Shurly, follow the use of the spray, and therefore would recommend circumspection in its use in asthenic patients. I have had a personal and striking experience with an aconite spray, after using the same on myself for an irritative cough, which it always controls. I became weak, my pulse frequent, breathing embarrassed and shallow; there were giddiness, nausea, and constriction of the pharyngeal muscles. Stimulants soon restored me, however. I also employed the preparations of aconite internally, in small doses frequently administered.

Dr. Shurly.—With regard to the dioxide of hydrogen and the chloride of ammonium, I did not mention them because they are not new. The dioxide of hydrogen was used quite extensively about twenty-five years ago, when it ran about such a course as cocaine is running now. It was especially extolled for the treatment of anæmia, diabetes, etc. It has, I believe, almost lost its reputation, except for some forms of nasal catarrh and wounds.

In reference to the oleate of aconitine, and the oleates generally, I would say that I have not had any reliable results, and therefore have ceased to use them.

In reply to the statement of Dr. Cohen that most remedies act with greater vigor when applied to the respiratory passages, I would say that this is one of the points that I endeavored to bring out in the paper in a negative way, for I do not think that it is generally the case. It is only certain agents which act more quickly or decidedly when applied and

absorbed by the mucous membrane of the respiratory tract. Aconite, for instance, certainly acts with greater celerity when applied to the nose and upper air-passages. And this is just the reason why it and other agents having marked effects when so used were not recommended for general use. However, personal preference will greatly influence one in the choice of a given agent.

Paper.

THE SIMPLEST AND MOST EFFICIENT TREATMENT OF DIPHTHERIA.

By WILLIAM H. DALY, M. D.

I SHALL not enter into the discussion of the cause, pathology, or clinical history of diphtheria, as the brevity of my paper forbids this; neither shall I hope to bring to your notice either a new plan of treatment or one that will cure anything like 90 to 100 per cent. of your cases of diphtheria; I would that I could do so and thereby claim your gratitude, and, probably, immortalize myself. Neither shall I discuss the identity or non-identity of diphtheria and membranous croup further than to declare that I have known respectable and apparently intelligent practitioners to pronounce cases of diphtheroid, diphtheritic, and croupous sore throat, either one of the three, with so much promiscuity as not only to stagger one's confidence in the practical possibility of nicely discriminating diagnoses, but to encourage the opinion that the method is largely in vogue of basing a diagnosis upon the results—viz., if the patient dies, the case was one of diphtheria or membranous croup; if the patient recovers, then there was little if anything at all the matter other than folliculous amygdalitis, or other unimportant disease.

Neither shall I attempt to open for discussion before this learned body any of the several other very vexed, though always alluring, and important questions that often take the form of pathological conundrums when they are by the identitist and non-identitist in way of argument flouted so scornfully at one another.

But I shall have the pleasure of drawing your attention to what in my hands has been not only the simplest, but the most efficient treatment of diphtheria. I refer to the calomel treatment. You say, "Oh! that is not new; I have resorted to the calomel treatment for several years." Then, I answer, I am glad to hear you say so, and pray that this brief article may serve at least to renew your

faith in it, and thus aid in saving the lives of more children, precious to their parents.

Touching the question of how new or how old this plan of treatment is, I found some time ago, when reading an old non-medical book,* a memoir of that learned philosopher, divine, and wit, the Rev. Sidney Smith, who was also, we may recollect, an educated physician, the following, which not only gives the respectability of age to this plan of treatment, but the crowning happiness of having been in more remote times successful. This note refers to a period about the years 1797 to 1799, at least eighty-six years ago; it runs thus: "A few months after the birth of Sidney Smith's daughter he went in the summer for a short time to Burnt Island, a small sea-bathing place at no great distance from Edinburgh, for the recovery of his wife's health; and here, but for his courage and firmness, he would have lost his long-wished-for daughter in a way he had not at all anticipated. When only six months old she fell ill of *croup* with such fearful violence that it defied all the remedies employed by the best medical men there. The danger increased with every hour. Dr. Hamilton, then one of the most eminent medical men in Edinburgh, was sent for, could not come, but said: 'Persevere in giving two grains of calomel every hour; I never knew it to fail.' It was given for eleven hours; the child grew worse and worse; the medical man in attendance then said: 'I dare give no more; I can do no more; the child must die; but at this age I would not venture to give more to my own child.' 'You,' said Sidney Smith, 'can do no more; Dr. Hamilton says to us: "Persevere"; I will take the responsibility; I will give it to her myself.'" He gave it and the child was saved.

Dr. Hamilton, of Edinburgh, a man of solid and courageous convictions, is seconded by a medical attendant of neither courage nor strength of moral character, but the father, a man whose life and character were strong and high above all foolish prejudice of any kind upon any subject, says: "I will take the responsibility, I will give it," and saves his child.

I salute your memory, Dr. Hamilton, with the utmost reverence for that courage that makes a man positive about that which he has tried and knows to be reliable, and I here place you on record before an association of some of the most learned men of your profession specially interested in the study of means to stay destruction

* "A Memoir of the Rev. Sidney Smith," edited by Mrs. Austin, vol. i. Harper Bros., 1855, p. 63.

of life from a disease the character of which you understood and knew how to treat so ably and successfully in remote times in medical history.

You will note that this case was treated by calomel, pure and simple; and that with two-grain doses every hour to a child six months old. You will also note that the case was called *croup*, and that we are not going to discuss the vexed question of the identity or non-identity of diphtheria and croup in this paper, or following it; and that the foregoing quotation is merely made with a view of recording gratefully the name and honor of Dr. Hamilton and the remote date of the calomel treatment. It will not do to fall back upon the sophistry that diphtheria was not known then, and that a case of croup could be better differentiated then than now, or that the case of Sidney Smith's child was one of croup and not diphtheria. The success of the treatment is sufficient proof to me that the case was one of diphtheria.

Now, briefly, as to the credit for the practice of the calomel treatment of diphtheria in modern medicine. To Dr. William C. Reiter, of Pittsburgh, a gentleman who was learned in other sciences as well as in medicine, this credit is due. He was the apostle of this plan of treatment of diphtheria, and he for many years persistently practiced the treatment, and promulgated the doctrine to his brethren, many of whom were at first unbelievers; he was an earnest and honest observer, fearless in the practice and assertion of what he deemed right. He had large experience and ripe judgment, and, as he stood for many years almost alone in the advocacy of the plan, he deserves still more our respectful praise and free acknowledgment.

In medical works the various mercurial plans of treatment are mentioned without, so far as I have observed, according to Dr. Reiter the credit of having advocated and practiced the method of treating diphtheria by the exhibition of calomel. I regard all the other mercurial preparations as mere excuses or substitutes for this best of all mercurials in diphtheria—viz., calomel. To any one caring to see the brochure of Dr. Reiter, which is little known of, and is so peculiar in its style as to entitle it to be considered an oddity in medical literature, I will say that it was published by J. B. Lippincott & Co., in 1878, and is entitled "A Monograph on the Treatment of Diphtheria based upon a New Ætiology and Pathology," by William C. Reiter, A. M., M. D.

As to the ætiology and pathology as enunciated by Dr. Reiter, I suppose one is at liberty to object or differ without being subject to

the suspicion of being unorthodox; but as to the treatment, I can truly say from substantial experience it is simple, and it is what is all-important to us—it is efficient.

Now, what is the method clinically? We will say, to a child three or four years old, suffering from diphtheria (early recognition and opportunity are, as a matter of course, of the utmost importance with this as with any other plan), give of pure, untriturated or unmixed with sugar, calomel, in two- to five-grain doses, every one, two, or three hours, either dry on the tongue and washed down with a little ice-water, or, as Dr. Reiter preferred it, given floated on a little ice-water in a teaspoon. This is repeated at intervals until free catharsis follows; the stools are to be carefully observed, and, when they assume the appearance of having floating in them gelatinous masses of dark, rather brightish-green bile, giving them an appearance resembling chopped spinach, or the water-polyps seen in watering troughs, then the intervals of the dose can be lengthened so as to keep up this condition of catharsis to the extent of one to three stools each day. It is not well to diminish the dose, but simply to lengthen the interval, as there is less liability by this means to produce ptyalism. This is an important point and ought to be remembered. It has been a matter of much surprise to me that there is little depression caused by the exhibition of these large and frequently repeated doses of calomel in diphtheria, and that ptyalism is so infrequent, especially so if the careful observation is made to keep up catharsis, or rather that fluid condition of the contents of the alimentary canal where the osmotic action is toward them from the blood-vessels, and not *vice versa*. Under this condition of treatment the membrane exfoliates and reforms, if at all, with less and less readiness; the fever abates; the prostration is slowly replaced by brightness and a disposition to activity, which latter should, of course, be prohibited lest heart paralysis or syncope should suddenly supervene and cause a suddenly fatal termination to the otherwise favorably progressing case.

Dr. Reiter was in the habit of alternating his doses of calomel with large doses of chlorate of potassium. This I have not found necessary, but I have adhered to the calomel in large and frequently repeated doses, with rather light but nutritious fluid diet, and have found it the most efficient of any treatment; and withal so simple for the nurse and so merciful to the patient. The latter is no small factor in the method when we compare the dreadful struggles of the little sufferer at the sight of the commonly used, shall I not say

abusively used, throat-brush and bottle, and all the other impedimenta of the more elaborate treatment to this simpler one of getting the child to open its mouth to drop a powder in, followed by a readily accepted spoonful of ice-water. There is needed no argument to show which is the most desirable practically; and I can assure you, my fellows, that this needs but a faithful trial to show you the greater efficiency of this over all other plans of treatment in results.

But there are some rules which I beg you will follow faithfully. These are: (1) Give calomel in its purity; (2) give it in large doses; (3) give it frequently; (4) give it until you have the free and characteristic catharsis; (5) give light nutritious diet; (6) give little or no other medicine.

If these simple rules are followed and common sense is allowed to take the place of common prejudice, you will save more of your diphtheria patients by this than by any other method known to modern medicine.

Discussion.

Dr. Shurly.—I have listened to the paper with much interest. I wish that I could be as positive as the author is. I have had considerable experience with all forms of diphtheria—having been a general practitioner for about fifteen years—and am also familiar with the use of calomel in the treatment of such cases. I quite agree with the speaker that calomel is very efficient in the treatment of croupous inflammation; but, when he says that it is the most efficacious agent for the treatment of diphtheria, I can not agree with him. The difference between croupous inflammation and diphtheria is very great, as we are all aware; and, while the conditions of the blood- and lymph-vessels which attend so-called croup are often promptly and efficiently relieved by calomel, it is not the case with diphtheria, which is a *specific* croupous inflammation, according to my experience, and I may say this accords with that of all of my professional colleagues with whom I have talked upon the subject. I do not believe, then, that any positive reliance can be placed upon the use of calomel in the treatment of *ordinarily severe cases* of diphtheria. At the same time, I reiterate that I think calomel one of the most useful general remedies for controlling ordinary croupous inflammation.

Dr. Donaldson.—It is very refreshing to hear a paper like that just read in these days of skepticism in therapeutics, and to see the confidence of so eminent a physician as Dr. Daly in one remedy, and not only in one remedy, but in one preparation of that remedy. But I must express much disappointment that he did not give us illustrative cases. I have seen diphtheria treated time after time with calomel without success. I therefore can not agree with Dr. Daly as to its value. I can not see that it has any specific effect. If any mercurial is to be used in diphtheria, a

better form would be the corrosive chloride, which is the best topical application we have for it to-day. This is used in solution of a strength suited to the case (ordinarily 1–1,000). Nourishing food, with alcoholic stimulants, should be given at short intervals. The patient ought to be kept in a well-ventilated room with an open fire-place, and all articles removed from the room which could carry or intensify infection. We should treat the diseased patient, and not the disease alone.

Dr. S. Johnston.—My attention has lately been called to the use of trypsin in solution as an application to the diphtheritic deposit, and I have used it in one case of croupous amygdalitis with good effect. In this case the uvula was immensely swollen and œdematous, the glands at the angle of the jaw were enlarged, and the tonsils covered with a tenacious pseudo-membranous deposit. The usual treatment with brandy, tincture of iron, and good food, together with the use of thymol, carbolic acid, and lime-water, was used, but without effect upon the deposit. I then applied trypsin; six applications were made in twelve hours, when the membrane had entirely separated. There was some oozing of blood from the tonsils as the membrane came off. The patient made a rapid convalescence. I think that this agent promises to be of great use in the future in removing pseudo-membranous deposits.

Dr. Robinson.—I do not suppose that there is a single remedy that has not been used by some man as a specific agent in diphtheria. I wish to express my entire confidence in Dr. Donaldson's statement; calomel is an old remedy, it has been used by many practitioners, and has been given up because it was not found effective. I should regret to admit that calomel was the only remedy in the treatment of diphtheria. Experience shows that remedies act differently; they are sometimes efficient and sometimes not, and unaccountably so. The disease itself varies at different times and in different cases; I have never seen in New York such types of the disease as I have seen in Europe. The cases of malignant diphtheria which can be seen at any time during the winter in the Children's Hospital in Paris are very rarely met with in New York.

I was called to a case two years ago which had been given up by a general practitioner; everything had been tried but bichloride of mercury, which I used in accordance with the instructions of a prominent New York practitioner, who recommended its use strongly, but the patient promptly died. No good effect was noticed.

Still, I believe in the specific treatment of diphtheria, and naturally in my own specific (cubebs). There is no clinical evidence sufficient to warrant the idea that calomel is a specific against diphtheria. A general consensus of opinion as to the line of treatment to be pursued seems to indicate: disinfect the throat and air-passages by sprays and topical applications; give internally iron and chlorate of potassium, and maintain the powers of the system by stimulants and food; the experience of most observers has shown this to be the most reliable plan of treatment; no

other should be generally substituted for it without the most careful investigation.

Dr. Bosworth.—I am glad that Dr. Daly has brought this subject before us for discussion. I believe that calomel does have something of a specific effect in diphtheria. I also believe that there is often a mistake in the diagnosis. Diphtheria is a blood poison which often kills by its toxic effects, but oftener kills by the development of croup. In the latter case the diphtheria does not kill directly, but by setting up the secondary affection of croup. Mercury has no effect upon the diphtheria, but it has a very decided effect upon croup; therefore a mercurial is the remedy to administer, because the croup is the fatal element. Diphtheria is a poison, like scarlet fever, which shows itself in the throat, its probable point of entrance into the body. The local affection in the larynx, however, is croup, and not diphtheria.

Dr. Mackenzie.—I am surprised that no one has spoken of the use of alcohol in this disease. I will not enter into the discussion of the pathology of diphtheria or question its identity or non identity with croup. I would, however, call attention to the fact that, of all remedies which have been used in the treatment of the disease called diphtheria, alcohol is the sheet-anchor.

Dr. Daly.—I did not expect that the method of treatment upheld in my paper would be received with much favor by this body. It did not receive much credit from me at the beginning, but if you will try it you will think better of it. From the tenor of the discussion, I can only conclude that some of those who have entered into it were not listening to the paper when it was read. Therein I distinctly said that I had not a *new* method of treatment to offer, and I did not say that calomel was a specific. I am not a believer in specifics. What I did say was that I had obtained better results in the treatment of diphtheria from calomel than from any other remedy or remedies. That was all; and I now wish to reiterate this statement, and I desire it to be taken for all that it is worth, for, after five or six years' experience with the calomel treatment, I come before you and say that it has given me better satisfaction than all of the other known methods of treatment together, and, until I can find something still better, I propose to continue its use. My friends in Pittsburgh have also used it, so that my opinion is based upon experience with sixty to eighty cases, either directly or indirectly. After trying all the other methods of treatment, with their heavy mortality, I turned to calomel in despair, but, after using it in some severe cases (and it so happened that these were in pauper children living in alleys and under very unfavorable conditions), I was surprised to find that they got well. I therefore propose to stick to the bridge which carries me safely over, and shall continue the calomel treatment of diphtheria until I find something better. I expected that the sentiment of this learned body would condemn the treatment; but pray let me say to you, if you will lay aside prejudice and try it, you will be pleased with the results. And I make

rather free to say that I suspect that even those who have spoken most adversely in this discussion of the method recommended, will nevertheless try it quietly, and, if they do, they will save their patients' lives more certainly than by any other means known to modern medicine. But I earnestly beg them, when they do essay a trial of the method, not to jeopardize its efficacy in any sense by ignoring the brief rules I have laid down, but *give calomel pure and simple, and no other medicine whatever.*

Paper.

THE QUESTION OF HÆMORRHAGE FOLLOWING UVULOTOMY. REPORT OF TWENTY-THREE CASES OF OBSTINATE UVULAR HÆMORRHAGE; DESCRIPTION OF A UVULAR CLAMP; BIBLIOGRAPHY.

By ETHELBERT CARROLL MORGAN, A. B., M. D.

THE operation of uvulotomy, so often performed and attended with insignificant after-trouble, may in rare instances be the cause of anxiety by reason of persistent primary or secondary hæmorrhage. "Clipping the uvula" is with some practitioners an operation practiced upon patients suffering from almost any disease of the upper air-passages. We should never under-estimate the liability to annoying and even alarming complications in this simple operative procedure, and should be prepared to promptly check all bleeding. Most authors briefly dispose of the question of hæmorrhage following uvulotomy by saying that such hæmorrhage is usually unimportant, and can always be readily controlled by the use of styptics —notably the gallotannic acid of the London Throat Hospital Pharmacopœia. Following I give the opinions upon this subject of leading authors from 400 B. C. to 1886 A. D.:

Celsus* says: "If the uvula descends, accompanied with inflammation, pain, and redness, it can not be excised without danger; for it is likely to discharge a large quantity of blood."

Rhazes† states "that when the uvula is enlarged, but is not red, the operation may be performed without danger. He mentions that some preferred the actual or potential cautery, but that he preferred excision."

Guidon‡ mentions "that after excision of the uvula, if the bleeding should be excessive, dry cups must be applied to the back of the neck, as proposed by Avicenna, troches of amber with plantain-water admin-

* Lib. vii, cap. xii, par. 3. Lee's Translation, London, vol. ii, 1836, p. 278.

† Contin., vii, and divis. i., 49. See "Paulus Ægeneta," Book VI, Lect. xxxi. Adams's Translation, London, vol. ii, 1846, p. 300.

‡ "Chirurgia magna," Leyden, 1585, p. 330.

istered, and the patient should be placed upon his face and told to expectorate in order to free his throat from blood, for, if any of the blood should descend, it might be the end of him."

Ravaton * says: "The wound bleeds, but the hæmorrhage is slight, and is stopped by gargling with fresh water."

Nich. B. Waters † says: "When the uvula is much enlarged, or there would be danger of considerable hæmorrhage from the use of the knife, the ligature should be preferred."

Benjamin Bell ‡ says: "By excision, troublesome hæmorrhages sometimes occur. Some practitioners indeed allege that no danger can ensue from any hæmorrhage that takes place from the removal of the uvula by excision; but, although this may frequently happen, yet I know from experience that instances of the contrary sometimes occur, and that large quantities of blood have been lost by this operation. This will most readily happen when the uvula is much enlarged. It will seldom happen, however, that any precaution [use of astringents] of this kind is necessary; for a moderate flow of blood will never do harm."

It is my opinion that the views of Benjamin Bell possess an accuracy worthy of the year 1886. His statements made in 1804 are in every way verified by my investigations to-day.

Desault # says: "It is seldom that a troublesome hæmorrhage results from the excision of the amygdalæ or uvula."

Liston ‖ says: "The connections [hypertrophy] may be such that the extirpation can not be attempted without great risk from hæmorrhage."

Gibson ^ quotes Benjamin Bell's remark about bleeding, and adds "that he had often operated, and never met with such an accident."

Troschel ◊ says: "The precautions against a severe bleeding are the same as in operations on the tonsil."

Dieffenbach ‡ says: "Bleeding is stopped with cold water. If more severe, powdered alum may be applied with a spoon; but I never found it necessary."

H. H. Smith ‡ says: "Whenever there be any hæmorrhage of consequence, touching the end of the stump with silver nitrate will generally arrest it."

* "Chirurgie," Paris, i, 1776, p. 264.
† "System of Surgery," Philadelphia," 1802, p. 317.
‡ "Surgery," Am. edition, Troy, N. Y., 1804, ii, p. 351.
# "Surgery," Philadelphia [Translation], 1814, i, p. 198.
‖ "Practical Surgery," London, 1838, p. 205.
^ "Surgery," Philadelphia, 1838, ii, p. 29.
◊ "Chirurgie," Berlin, 1839, i, p. 227.
‡ "Operative Surgery," Leipsic, 1848, ii, p. 94.
‡ "Operative Surgery," Philadelphia, 1852, p. 181.

Demounilliers* says: "The flow of blood resulting from the little operation usually stops of itself, or by the aid of an astringent gargle."

Gross† says "that no hæmorrhage, properly so called, need ever be looked for."

Gross‡ says "that no hæmorrhage need be looked for, nor is the excision attended with any great pain."

Gayraud# says: "Hæmorrhage is usually trifling; once Voss‖ saw it last all night. Where there is varicose development of the uvula, the bleeding may be considerable. Ancelor had to use in one case perchloride of iron, and in another the actual cautery. Voss preferred silver nitrate."

Mackenzie△ says: "Occasionally severe and continuous hæmorrhage follows the little operation, but it can always be checked by slowly sipping a teaspoonful or two of the tannogallic gargle."

Cohen◊ says: "The bleeding after excision of the uvula is usually insignificant; but occasionally it is quite profuse."

Browne‡ says: "If the patient be directed, after the operation, to sit perfectly still without washing the mouth, hæmorrhage but seldom occurs; should it happen, the sipping of a few drachms of a saturated solution of tannin will speedily check it."

Bosworth‡ says: "After the operation the hæmorrhage is slight, as a rule, and the wound heals kindly in the course of a few days or a week."

Sajous‡ says: "A ten-per-cent. solution of cocaine, applied just before the operation, renders it almost painless, and prevents the slight bleeding which usually occurs."

Seiler** says: "The pain and hæmorrhage in this operation are very slight; indeed, not infrequently altogether absent."

Schech†† says: "The wound heals in a few days without much pain."

He does not mention hæmorrhage in connection with uvulotomy.

Obstinate hæmorrhage following uvulotomy is a rare accident, and has never occurred in the Metropolitan Throat Hospital, New

* "Compendium de chirurgie," Paris, 1852–'61, iii.

† "Surgery," Philadelphia, 1859, p. 651.

‡ "Surgery," Philadelphia, 1872, ii, p. 553.

\# "Dict. Encycl. des sci. méd.," xix, p. 698.

‖ "Norsk. Mag. f. Lægevidensk," 3 R., vii, 1877, p. 77.

△ "Diseases of the Pharynx, Larynx, and Trachea," Philadelphia, vol. i, 1880, p. 41.

◊ "Diseases of the Throat," N. Y., 1879, p. 219.

‡ "The Throat and its Diseases," Philadelphia, 1878, p. 129.

‡ "Diseases of the Throat and Nose," N. Y., 1881, p. 96.

‡ "Diseases of the Nose and Throat," Philadelphia, 1885, p. 298.

** "Diseases of the Throat, Nose, etc.," Philadelphia, 1883, p. 185.

†† "Diseases of the Mouth, Throat, and Nose," Blaikie's transl., Edinburgh, 1886, p. 129.

York,* during ten years, and in over one thousand uvular operations. It has never happened in the Central London Throat and Ear Hospital, † and numerous other institutions in this country and Europe.

My experience up to this writing accorded with the views of the majority of the authors quoted above; but I certainly think the cases reported to-day would suggest the exercise of a little caution on the part of the enthusiastic uvulotomist. Moreover, a slight modification of existing opinions and generally accepted teachings may be demanded, as the result of the indisputable records furnished us by medical literature. Many operators are not content with excising the prolapsed portion of the uvula, but essay to remove all traces of the existence of this inoffensive little organ, thus unnecessarily increasing the danger of hæmorrhage, especially if great hypertrophy exists. The gentleman concerned in my report had been subjected to total excision, had been bleeding copiously at intervals during a period of five days prior to his application to me for relief, and was in a distressing state of body and mind.

Mr. V. A. H., aged twenty-eight, applied to me on March 24, 1885, stating that his uvula had been excised five days previously, and that, four hours after the operation and at short intervals since, he had experienced abundant hæmorrhage, for the control of which powdered iron persulphate, Monsel's solution, ice, alum, silver nitrate, gallo-tannic acid, and other styptics had been employed without success. He was greatly excited and anxious; his face pale, hands cold, and pulse weak. Upon cleansing the parts and examining them by reflected light, two bleeding points, situated respectively near the anterior and posterior portion of the uvular stump, were visible, and occasioned a rapid and continuous dropping of blood upon the tongue. The stump left after the operation was with difficulty detected, as the mucous membrane and submucous tissues appeared to have retracted, leaving the azygos fasciculi uncovered. The uvula of Mr. H. had been greatly hypertrophied, as was fully proved by the broad, hard stump left after amputation. He informed me that the forceps and scissors were employed in operating. There was no hæmorrhagic diathesis in this patient, nor in any member of his family, and several of the latter had undergone surgical operations without experiencing any untoward consequences. I first removed the firm coagula of blood and iron persulphate which covered the hard and soft palate, pharyngeal walls, teeth, and tongue. The parts mentioned and the uvula were then cleansed by means of an alkaline spray and dried with absorbent cotton. The stump was firmly seized with a dressing forceps and continuous pressure exerted, but the hæmorrhage was only partially

* Personal communication from Dr. G. B. Hope.

† Personal communication from Mr. Lennox Browne, F. R. C. S.

controlled, as the patient could not tolerate the instrument for any length of time. The galvano-cautery blade, at a cherry-red heat, was freely applied to the bleeding surface, and the hæmorrhage was promptly controlled. An hæmostatic of ext. ergot fl. ʒ ss, acid. sulphuric. aromat. ♏xx, tr. opii, ♏xv, was ordered to be taken in water every three hours. He was directed to take his food in a liquid state and cold, and to refrain even from talking, using a writing tablet for necessary communication. The hæmorrhage recurred within nine hours, when the cautery was again successfully used and the stump dusted with powdered iron persulphate. He came to my office at 11 P. M. the same day saying he was bleeding, but examination proved only the presence of a firmly adherent coagulum, which I did not disturb. The following morning at eight o'clock, or the sixth day after the uvulotomy, a copious dripping of blood took place; strange as it may appear, by actual measurement, not less than a fluid-drachm flowing in a minute. The entire throat was again thoroughly cleansed and dried, and a careful rhinoscopic examination for the second time made to discover if the hæmorrhage could possibly proceed from the

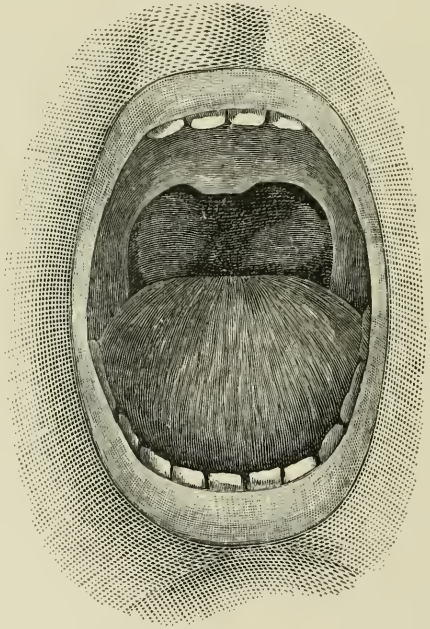


Fig. 1.

naso-pharynx, or from some pharyngeal vessel wounded during the performance of the original uvulotomy. The naso-pharynx and superior surface of the velum palati were free from blood and uninjured, showing

that the abundant hæmorrhage proceeded from the uvula alone, incredible as it appeared. Melted crystals of chromic acid were applied to the stump and the hæmorrhage was again checked. This state of affairs did not continue long, for at three o'clock of the same day persistent and copious bleeding recommenced. The stump was again subjected to the galvanocautery, but the bleeding continued. An effort was made to transfix the base of the uvula by double suture (see Fig. 1), but there was insufficient stump to hold even a silk or silver thread. All ordinary methods having been exhausted without avail, and as I could not possibly ligate so short a uvula, I hoped to attain my purpose by torsion, or compressing the arteries and veins concerned. The first was tried to no purpose, but the second completely and permanently checked the hæmorrhage, although obtained in a novel manner. One of those small spring clamps used in retaining shirt-sleeves in position, and which can be purchased at any furnishing-store, was trimmed down with shears, the spring weakened, and a string attached to a perforation made in one of its arms. The arms of this improvised instrument were widely separated by means of a dressing forceps, quickly slipped over the uvula and well up on the soft palate; the forceps was withdrawn and the clamp remained securely fastened and in the de-

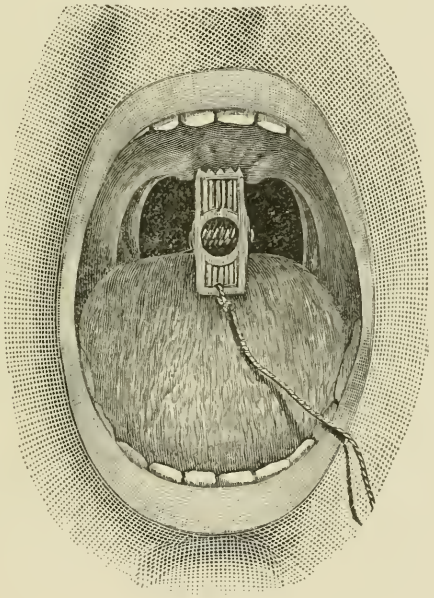


Fig. 2.

sired position. The teeth of the clamp had been slightly filed down prior to introduction, and the string attached to the instrument was secured

on the forehead of the patient. The upper portion of the clamp grasped and compressed the soft palate in the median line, and about one sixth of an inch above the point at which uvulotomy had been performed (see Fig. 2). The clamp was allowed to exercise pressure for several hours, when it was removed temporarily in order that the patient might take nourishment. It was, however, never necessary to replace this little device, which accomplished so thoroughly and rapidly the end for which it was employed.

After a laborious search through laryngological literature, I have failed to find that any device similar to my clamp has ever been suggested or employed for the purpose of controlling uvular hæmorrhage. Dr. Löri,* of Budapest, is reported to have used a miniature instrument shaped like a "paper-clip" to seize and draw the velum forward during the performance of posterior rhinoscopy. I have modified my clamp during the past year, and several instrument-makers—among them Snowden, of Philadelphia—have endeavored to improve upon the original clamp, but thus far without success.

Malgaigne† says "that on one occasion, after Lisfranc removed the uvula, there was an alarming hæmorrhage. Astringent gargles, ice, and cauterization with nitrate of silver, were all tried and failed. Lisfranc then took the end of the uvula between the branches of a pair of ordinary forceps, and applied nitrate of silver to the wound rendered bloodless by the compression; this succeeded as if by magic, no more hæmorrhage occurring."

Gueneau de Mussy‡ mentions the case of an old man whose uvula he had partially excised to relieve sudden suffocative seizures caused by an hypertrophied uvula as large as the little finger. The operation demonstrated that there was thickening of all the tissues, and a large gaping artery spurted blood from the center of the wound at considerable distance. The hæmorrhage ceased after compression by the forceps and the use of astringent gargarisms, but during the day returned with such violence that the patient filled a wash-basin, holding sixty-four ounces, with blood. The actual cautery was then applied to the bleeding surface and the hæmorrhage permanently checked.

Dr. E. Fournié# reports a case of hæmorrhage following uvulotomy in an abbot superior of a seminary. He does not state the patient's age. The throat was uniformly red; mucous membrane swollen and everywhere thickened. The uvula was also prodigiously enlarged, measuring

* Voltolini, "Rhinoscopie und Pharyngoscopie," 1879, p. 17; see also Mackenzie, *op. cit.*, vol. ii, p. 252.

† "Revue méd.-chir.," Paris, ii, 1847, p. 340.

‡ "Traité de l'angine glanduleuse," Paris, 1857, pp. 75, 76.

"Revue méd. franç. et étrang.," 1884, i, p. 437.

2½ by 1½ ctm., and the tissues were hard. Silver nitrate in solution was applied daily, and then about half of the uvula was excised, using a grooved forceps with curved scissors. There was no bleeding and no acute pain, the surface was cauterized with a mild solution of silver nitrate, and the patient instructed to gargle with vinegar and water. Four hours afterward the patient was found to be and to have been losing blood from the cut surface. It escaped drop by drop, and almost by jets, and was arterial. Perchloride of iron was applied and held against the bleeding part, but the bleeding recurred. The uvula was then grasped with the dressing forceps, perchloride of iron being still applied. On removal of forceps, the bleeding again recurred. A nasal polypus forceps, slightly curved at its ends, and broad enough in the bite to compress the entire remainder of the uvula against the palatine vault, was next applied, for twenty minutes. No bleeding then taking place, the patient attempted to walk to his room, but fainted. He was soon revived by cordial, and no more bleeding occurred.

Spagnolo * reports a case of persistent hæmorrhage after uvular excision occurring in the practice of Dr. Zambaco, of Constantinople. The resulting hæmorrhage was by some held to be responsible for the death of the patient under a "*post hoc ergo propter hoc*" species of reasoning. The patient had long suffered with inflammation of the throat, increased by every change of temperature. Dr. Zambaco, of Constantinople, Louis, Andral, Ricord, and Tardieu were consulted in this case. Zambaco and these eminent Parisian physicians recommended excision of the uvula. Zambaco cut it off with scissors. A slight bleeding followed, but ceased after gargling with cold water. Four hours later bleeding recurred, and ceased when iron perchloride was freely applied. Next day there was gastric cramp, with intestinal colic, and bloody stools. The perchloride was again applied to the wound and bleeding stopped. The patient was very anæmic. An intense diarrhœa supervened subsequently, and he died eight days after the operation. The reporter says that the patient wore an artificial denture, taking it out at night, and he thinks that the habit of suction acquired by those who wear the dentures produced the hæmorrhage. There is a question whether so much bleeding from the bowels could have originally come from the uvula through the swallowing of blood. There was no autopsy to show the real cause of death.

Carlo Labus's cases†: "The first case was a contractor, aged thirty, of robust constitution, who had been suffering for three years with a dry, irritating cough, caused by an elongated uvula.

"The hæmorrhage which followed the operation, and which in several hours had nearly ceased, recommenced toward evening and steadily increased.

"The next day, the hæmorrhage continuing, I employed a spray of the

* "L'Union méd. d'Orient," Constantinople, No. 24, 1880; also "London Med. Record," 1881, ix, p. 24.

† Personal communication to the writer from Dr. Carlo Labus, of Milan, Italy.

tr. chloride of iron, which arrested momentarily the bleeding, but it soon began again. I then touched the cut surface with a crayon of silver nitrate, but without success. Finally, by means of the galvano-cautery, I arrested the hæmorrhage. As a predisposing cause, I can only cite the plethoric constitution of the patient. The operation was performed by means of the scissors.

"The second case was a man of fifty years, and, like the former, of good health. I performed uvulotomy on account of a chronic pharyngitis.

"The blood continued to flow drop by drop, notwithstanding the application of ice, for three days, yet the patient suffered no great inconvenience. This operation was also performed by means of the scissors."

Dr. Felix Semon's case*: "A man of fifty-five, strong, and of florid complexion, was operated at St. Thomas's Hospital, London, for a long and very thick uvula, which apparently produced an incessant dry cough.

"The hæmorrhage was primary, lasting from 3 P. M. until 6 A. M. next morning, was rather considerable in quantity, and was of a parenchymatous character.

"The bleeding stopped spontaneously, after all possible local hæmostatics, such as alum, tannin, iron perchloride, gallic acid, ice, galvano-cautery at dull-red heat, had failed.

"The man stated that he had always bled considerably when slight operations, extraction of teeth, etc., had been performed on him, and that he was sometimes subject to epistaxis, but no definite history of hæmophilia, either in him or in other members of his family, could be elicited.

"M. Mckenzie's uvulotome was the instrument used, and the cough was not relieved by the operation."

Dr. Morell Mackenzie's case†: "A man of about sixty years was operated for an elongated, not broad, uvula by means of a special form of blunt-pointed scissors. The bleeding was primary, and lasted from twelve noon until nine that night, and from one to two pints of blood must have been lost. Ice and the electric cautery were tried in vain. Attempts were made to tie the stump; but the ligature always came off. The hæmorrhage finally ceased of its own accord. I could see no particular cause for the bleeding. This is the only case I have ever met with, and it occurred in 1865 or 1866, before I was acquainted with the efficacy of a mixture of gallic and tannic acids, when swallowed, in checking all bleeding from the throat."

J. H. Hartman's‡ cases: The first patient was a female, twenty-six years of age, upon whom uvulotomy was performed with Elsberg's uvulatome for elongation. The hæmorrhage was primary, lasted all day, and

* Personal communication to the writer from Dr. Semon, of London, Eng.

† Personal communication to the writer from Dr. Morell Mackenzie, of London, England.

‡ Personal communication to the writer from Dr. Hartman, of Baltimore, Md.

was finally controlled by the galvano-cautery. There was no assignable cause for the bleeding which was arterial.

The second patient was a man of thirty-five years, also operated for an elongated uvula by means of Browne's uvula scissors, and in whom the bleeding was secondary. It was checked in three hours by applications of iron subsulphate. Bleeding arterial.

Dr. Hartman also sends the record of a patient who bled copiously for one hour succeeding operation.

Dr. D. Bryson Delavan,* of New York, reports the following case: "A male patient, aged forty-five, married, and an American, was operated on for elongation of the uvula. This elongation caused distressing paroxysms of cough (particularly upon his lying down), as well as insomnia, vomiting, great general disturbance, and pharyngo-laryngeal irritation. The hæmorrhage was primary, lasted about four hours, the patient becoming pale and pulse weak, probably as much from nervousness as from loss of blood. The actual amount of blood lost is unknown. Silver nitrate applications controlled the hæmorrhage. The patient was excited at the time of operating, and the vessels of the uvula and pharynx were congested. He died six months later from chronic interstitial nephritis. The instrument employed was Elsberg's ring uvulatome."

Dr. D. N. Rankin's cases†: "The first case was a male, aged thirty, a resident of Alleghany, Pa. He had, for several months previous to calling on me for advice, been troubled with an irritable cough, without expectoration. This was early in 1884. Upon examination of the throat, I discovered an extensive elongation of the uvula, sufficient to cause the cough, and advised abscission to relieve it. The operation was done with the uvulatome, after which I prescribed an astringent gargle. The operation was performed about 2 P. M. In the evening, about six o'clock, the patient hurriedly sent for me. When I arrived at his home he was bleeding quite freely from the excised uvula; the cut surface was touched with solid nitrate of silver, it failing to check the bleeding. I then advised him to keep a piece of ice to the bleeding point. Hot water was used; an attempt to use the galvano-cautery was made, but, as is usual when you want to use the cautery in an emergency, it does not work satisfactorily. With the Monsel's solution and ice the hæmorrhage, after continuing incessantly for thirty hours, was checked. As to the amount of blood lost it was impossible to ascertain, as he doubtless swallowed a large quantity of it. No pulsation in the uvula was noticed, else I would most certainly have ligated the uvula near its base. No hypertrophy, merely elongation. No hæmorrhagic diathesis."

"The second case was a male, aged about thirty-five years, a resident of Alleghany. When he presented himself at my office he was suffering

* Personal communication to the writer from Dr. Delavan, April, 1886.

† Personal communication to the writer from Dr. Rankin, of Alleghany, Pa.

from difficult breathing. Upon examination of the throat, I discovered great œdema of the uvula. It was at once scarified. This giving him no relief, it was almost entirely abscised with forceps and scissors. Little hæmorrhage occurred immediately after the operation, which was made about 2.30 P. M. Hæmorrhage commenced next day at noon, and continued incessantly for twenty-four hours, notwithstanding ergot, internally, and astringent gargles were used. Finally, after using hot-water gargles, it was checked. I can not estimate the amount of blood lost, but it was very great."

Dr. Joseph E. White's case*: "The patient was Dr. William M. T., of Culpepper, Va., who, in 1878, was suffering from naso-aural catarrh, with some hypertrophy and relaxation of the mucosa. The uvula was hypertrophied and elongated, and was a great annoyance from the constant tickling it caused in the throat. I clipped it about 11 A. M.; the bleeding ceased in a few moments, and he went back to his boarding-house to write to his wife. At one o'clock I went to my clinic at the City Hospital, and whilst there the doctor came in bleeding profusely, spitting up mouthful after mouthful of blood. He told me that while writing to his wife he hawked once or twice violently to dislodge some mucus in his throat, and, as a result, commenced bleeding. When I tried to examine his throat I found the blood flowing so rapidly that it was difficult to get a view of the uvula. I tried ice, the perchloride of iron, and a saturated solution of tannic and gallic acids without avail, alternated with attempts at compression with a pair of forceps (which latter made him sick whenever they were applied) for more than an hour. As he had then been bleeding profusely for more than two hours, and was much weakened by loss of blood, I resolved to try the actual cautery. As soon as the instrument was red hot I told him to open his mouth, and was in the act of burning the uvula when the bleeding suddenly ceased, and my patient collapsed in a fainting condition. From this he soon rallied, was taken home, put to bed, given a dose of ergot, and advised to continue the use of ice and the mixture of tannic and gallic acids. There was no return of the hæmorrhage afterward."

Dr. E. Brallier's case†: "William A., aged fifty-five, was operated on, October 27, 1885, for an elongated uvula, which was the cause of an annoying tickling cough. The uvula was narrow and not hypertrophied. About three quarters of an inch of the prolapsed organ was removed, a uvulatome made by Kolbe being used. The usual bleeding occurred at the time of operating, but continued until during the night, when it became both copious and alarming. The patient was finally exhausted from the hæmorrhage, which continued sixteen hours, with a loss of at least two quarts of blood. Astringents and styptics were used without avail,

* Personal communication to the writer from the operator, Dr. White, of Richmond, Va.

† Personal communication to the writer from Dr. Bralher, of Chambersburg, Pa.

but compression with the forceps and cauterization controlled the bleeding. From the slight spurting and light color of the blood issuing from the stump, there is no doubt of its being arterial."

Dr. J. G. Carpenter's case*: "Male patient, aged thirty-five, operated for elongation with forceps and scissors.

"The bleeding was primary, quite copious, lasted twenty-four hours, and was finally checked by employing pressure, styptics, ice, and hypodermics of morphia and atropia.

"This patient was suffering from a chronic naso-pharyngeal catarrh, and was operated during an acute exacerbation of the same."

Dr. Carpenter states that the doctor who operated was not a graduate of medicine, and that the uvula was completely removed, which resulted in the frequent regurgitation of solids and liquids through the nasal passages.

Fatal case furnished by Dr. Meyer†: "Erich, an earl, the son of Hakon, was on his way to Rome, but died in England from an uncontrollable hæmorrhage which resulted from cutting his uvula."‡

This case probably occurred in 1035, and the foregoing is a free translation by me from the original Latin,# which I have found and which reads as follows: "Dynasta Eirikus Hakonis filius, cum itineri Romam accinctus esset, in Anglia obiit; is, secta uvula, cum sisti sanguinis nequiret, mortem appetiit."

The operator's name, the age of the earl, and other interesting data are wanting.

Dr. Baratoux's cases‖: "A lawyer of fifty, of rheumatic diathesis, the subject of cardiac disease and of occasional cerebral congestions, was operated with Warren's scissors.

"His uvula was greatly elongated, reaching to the superior border of the epiglottis, which it tickled. The vessels of the pharynx were varicose. The bleeding was primary, lasted halt an hour, and was arrested by penciling with a solution of zinc chloride.

"The second case was a male, of thirty-six, operated by the galvano-cautery loop for prolapsus, and the presence of three polypi on the extremity of the uvula. Copious secondary hæmorrhage occurred, lasting three hours, and was checked finally by forceps, pressure, and zinc chloride applications.

"Third case, a female of forty, operated for an hypertrophied uvula by means of a polyptome with cold wire. Bleeding lasted several hours and was stopped by the galvano-cautery."

* Personal communication to the writer from Dr. Carpenter, of Stanford, Ky.

† Personal letter from Dr. Wilhelm Meyer, of Copenhagen, to Dr. William H. Daly, of Pittsburgh, and published for the first time, with the latter's consent.

‡ "Knytlingasaga," chapt. xvi, 1828, p. 200.

"Scripta historica Iclandorum," etc., Hafniæ, 1842, ch. xvi, 188.

‖ Personal communication to the writer from Dr. J. Baratoux, of Paris.

I decided to include Baratoux's three cases in my essay, although it is evident that neither of them possesses that interest characterizing the twenty other reports.

Dr. J. O. Roe's case:* "Mrs. L., aged twenty-five years, married. Has had most of the time, for several years, an irritating cough and an inclination to swallow frequently.

"Three years ago she had a mild attack of diphtheria, which left her throat sensitive to dust, damp air, etc., and she has since been hoarse quite often. An examination revealed a greatly elongated uvula, a chronic granular pharyngitis, and a chronic laryngitis.

"The uvula was quite thick and so long as to lie on the base of the tongue, and to touch the upper border of the epiglottis. I advised shortening the uvula by uvulotomy and local treatment to the pharynx and larynx. Accordingly, I removed the elongated portion of the uvula with a pair of straight uvula-scissors, having their points curved inward to prevent the uvula from slipping out on being cut. The uvula was left, after the operation, fully its normal length.

"Very little hæmorrhage followed the uvulotomy, and the patient in a short time left my office for her home. Soon after, however, I was called hastily to see her on account of profuse hæmorrhage that was taking place from the cut surface. Ice and the application of subsulphate of iron had no effect to control the hæmorrhage, and I only succeeded in arresting it by grasping quite firmly the stump of the uvula with a pair of large sized dressing forceps.

"These were retained on the uvula for about three hours, after which there was no recurrence of the hæmorrhage."

Having described the clinical histories of these unusual cases, I desire to bring to your notice the results of my literary research regarding the question of hæmorrhage following uvulotomy. With a view of making the present paper exhaustive, I addressed six hundred copies of the following letter to the laryngologists of the world, as well as to the more prominent surgeons and practitioners of medicine in this country, asking their experience in the matter of hæmorrhage after uvulotomy.

918 E Street, Northwest, Washington, D. C., *April 1, 1886.*

My dear Doctor: I have been recently investigating the subject of obstinate hæmorrhage following uvulotomy. My purpose is to collect the interesting *unrecorded* and *recorded* examples of this rare accident and to publish them in the form of a monograph. In case you have met with such hæmorrhage, may I ask you to aid me in this undertaking by answering and returning the accompanying questions to my address? Brief details of cases of hæmorrhage following uvulotomy occurring in

* Personal communication from Dr. J. O. Roe, of Rochester, N. Y.

your own practice or the practice of others, as well as any references to medical literature, will be greatly appreciated by

Yours respectfully,

E. Carroll Morgan, M. D.,

Fellow of the American Laryngological Association, Professor of Laryngology, Med. Dept., University of Georgetown, Washington, D. C.

1. State age, sex of patient, etc. 2. For what reason was uvulotomy performed? 3. Was the bleeding primary or secondary? 4. What was the duration and extent of the bleeding? 5. How was the bleeding finally controlled? 6. Was there an assignable cause for the bleeding? 7. What instrument was employed in operating?

The prevailing opinions of these gentlemen are reflected in my essay to-day, and I take this opportunity to express appreciation of their prompt response to my call for information. The widely scattered examples of uvular hæmorrhage have, for the first time in the history of medicine, been collected and added to the unrecorded cases, which I secured by the above-mentioned letter.

I wish at this point to state emphatically that my present investigation was not inspired by any desire to play the rôle of alarmist regarding uvular hæmorrhage, but, on the contrary, to present the subject in its true light, and to record the numerous examples of this rare accident hitherto ignored.

Those who would exsect, as also those who would not even clip, a uvula may find little comfort in my studies; for the conclusions therefrom do not lead me to espouse the opinions of either class of extremists.

Death has resulted from bleeding after excision of the uvula in one instance,* and the bleeding in Zambaco's † patient probably hastened the fatal termination of a chronic disease. It appears from the Hippocratic ‡ and other # treatises that excision of the uvula was occasionally performed in early times. There is, according to my reading and interpretation, evidence to prove that Hippocrates ‖ was at one time in the habit of amputating uvulæ by means of his finger-nails, although he also employed cutting instruments. Celsus △ seized as much of the organ as he deemed it advisable to retain with a pair of forceps, and cut below the instrument. Fabricius ab Aquapendente ◊ excised with scissors only, and applied a heated (not

* Read Meyer's report, cited above, which I have verified. † *Op. cit.*

‡ "Prognost. de morbis," ii, De affect.

Aretæus, Περὶ αἰτίων καὶ σημείων, κ.τ.λ., fol., Lugd. Bat., 1735, cap. viii, p. 7.

‖ Lisfranc, "Revue méd.," Paris, 1823, vol. xi, p. 241.

△ *Op. cit.*, vii, 12. ◊ *Op. cit.*

incandescent) spoon to the bleeding stump. No obstinate hæmorrhage is mentioned by these authors. Albucasis,* Avicenna,* and Oribasius,* also Actius,* removed the uvula by cutting instruments. Some of the older surgeons surrounded their operations upon the uvula with great ceremony, and a regard for details quite praiseworthy. Paulus Ægineta,† for example, was accustomed to employ instruments expressly made for this operation: a staphylagrum to hold the uvula, a staphylatome to divide it, and a staphylacaustum to cauterize the wound. Galen, ‡ Mesué,# Nuck,# and Boss # seem to have belonged chiefly to the expectant school, ignoring surgical procedures in treating elongated uvulæ, the three latter advising traction upon the hair of the head to such a degree as to tear the skin from the cranium. This traction was accomplished by tying the hair up in a ribbon near its roots, and twisting until a top-knot was formed. It may not be generally known that, even to this day, the southern negroes resort to the above-described method with implicit faith in its never-failing power to raise the palate. I find that Mesué ‖ also directs the operation to be performed with a heated scalpel of gold. During the reigns of Antonius and Serverus, Aphrodesia violated the public confidence and made himself famous by seeking to inspire the fear that those persons who suffered excision of the uvula at its base would always die of consumption.△ Cauterization ◊ is first mentioned by Demosthenes, of Massilia. The Arabians ↕ destroyed uvulæ by caustic and by the red-hot iron. Paré ↕ used the ligature, and the two Fabricii,‡ at various periods, scissors, caustic, and ligature.

M. Tholozan,** in a note upon excision of the uvula by Persian barbers, says:

"In the districts of Semnan and Fironz-Kouh, situated five days' march to the east of Teheran, excision of the uvula is practiced by the Persian barbers on nearly all the children, as a prophylaxis of inflammation of the throat. They use a strong wooden spatula and a thick steel rod, whose sharp end is curved on the flat or shaped sometimes as a com-

* Chelius's "Surgery," translation by South, Philadelphia, 1847, i, p. 167.
† Velpeau, "Operative Surgery," iii, New York, 1847, p. 385.
‡ "De med. sec. loc.," vi.
# Velpeau, "Operative Surgery," New York, 1847, iii, p. 385.
‖ De ægr. gutturis, 3.
△ "Revue méd. franç. et étrang.," Paris, 1823, xi, p. 241.
◊ Chelius, *op. cit.*, p. 167.
↕ *Op. cit.*
‡ *Op. cit.*
‡ *Op. cit.*
** "Bull. de l'Acad. de méd.," 1884, p. 8.

plete ring, seven to eight mm. in diameter. They are so constructed as not to endanger neighboring parts. The barber passes the spatula rapidly into the throat and presses it from behind forward against the uvula. He then applies the cutting instrument to the concavity of the uvula produced by the pressure of the spatula. The uvula is then cut by pressure combined with lateral movements. The piece cut off is withdrawn by the two instruments held in juxtaposition. They practice this operation very dexterously, charging for it a few centimes. Women practice it also in the harem. The practice dates back many generations. It is usually done at the age of one, two, or three years. In addition to preserving them, as they suppose, from danger of frequent and severe sore throats, they think the danger of suffocation is lessened. No accident seems to occur in connection with this operation. The practice is confined to the districts mentioned; inflammation and catarrh of the throat are very frequent here."

"The cutting of the uvula has been customary in the northern provinces of Iceland,* if not over the whole country, from the earliest times. The operation, as a rule, is performed during childhood; if not then, later in life. The operation is performed partly because it is supposed to be able to prevent diseases of the throat, and partly because there is a great deal of superstition connected with the results of the operation—for example, in preventing sickness and general indisposition. A merchant from Iceland has told me that he knew a child of seven or eight years, who was very small, and its slow growth was supposed to be caused by the fact of its uvula not having been removed at an early age; the operation was performed in the hope that the child would thrive better in consequence. The same gentleman says he knows that the uvula has been cut in grown-up persons after angina to prevent relapse, but never during the disease. He never heard of any case where an unfortunate result such as hæmorrhage followed the operation. I myself have seen two vela whose uvulæ had been cut away from Ofiord and Husavih, in the north part of Iceland. In both cases the uvula was cut out at the root, and in both it was done in early age (from one to two years), the usual age at which the operation is performed.

"The operation, which is thought as necessary as vaccination, is performed by peasants who are accustomed to do it, and of whom there are one or more in each parish. They do it with an instrument which is a little like Morell Mackenzie's tonsillotome, and the instrument is called Ufvrskaeri and made with great skill by the smiths. The operation is said to have been performed less frequently during the last few years."

Conditions which may or may not influence the occurrence of hæmorrhage after uvulotomy:

* Letter from Dr. Wilhelm Meyer, of Copenhagen, to Dr. William H. Daly, of Pittsburgh.

"*Anomalous Blood-supply.*"—The existence of an anomalous arterial or venous distribution to the velum palati and uvula has never been appreciated as a probable cause of copious hæmorrhage following uvulotomy. In my judgment, several of the cases cited to-day point clearly to a larger artery than commonly supplies the uvula being the source of the bleeding. The vascular supply of the uvula remains even to-day somewhat in a cloudy condition, little that is definite being accessible upon the subject. A necropsy alone can of course decide the existence or non-existence of supernumerary arteries.

Dr. J. W. Farlow,* of Boston, says, in reference to this question of anomalous pharyngeal blood-supply, that he has lately seen three cases in which there were large, pulsating arteries to be seen on the back of the pharynx.

"One girl, aged sixteen, had a very large artery on the left side and a less marked one on the right side of the pharynx about a quarter of an inch inside of the posterior pillar of the fauces."

This case he showed at a medical meeting, and Dr. F. I. Knight and Dr. De Blois have seen it:

"Another case was a girl of twenty-three, only in her the artery was on the right side alone.

"The last case was a woman of twenty-six and was similar to the first, the arteries in both instances being apparently larger than the radial.

"Dr. Thomas Dwight, professor of anatomy in the Harvard Medical School, says that these cases are probably abnormalities of the ascending pharyngeal artery."

Instruments Employed. — Excluding the snare,† the galvano-cautery,‡ and the ligature,# and surely these methods are not generally selected in uvular excisions, hæmorrhage results equally from the use of various instruments. The instruments employed in operating on the cases of hæmorrhage reported to-day were the scissors, the bistoury, or the uvulatome; and simply because ninety-nine out of every hundred patients are operated on with the scissors, the bistoury, or the uvulatome. My investigation convinces me that the particular instrument used, with the exceptions noted, is of no im-

* Personal communication to the writer.

† Morgan (E. C.), "The Value of the Snare in performing Uvulotomy," "Maryland M. J.," Balt., September 26, 1885.

‡ Letter from Mr. Lennox Browne, London.

Waters, "System of Surgery," Philadelphia, 1802, p. 317.

portance, so far as bleeding is concerned, for the Persian barbers,* with their crude method in their thousands of operations, have never encountered trouble.

Pathological Condition of the Uvula.—Excessive hypertrophy, or the development of a varicose or "hæmorrhoidal state" of the veins of the organ, assuredly tends to increase the loss of blood following uvulotomy. Most of the cases cited in my paper were instances of uvular hypertrophy, in a few the organ being of enormous dimensions. Operations performed during the existence of acute inflammation, œdema, or ulceration, are more likely to be succeeded by bleeding than operations made for a simple prolapsus. The instances of so-called spontaneous uvular bleeding reported by René Vanoye,† Rudolph,‡ and Würzburger# do not fall within the scope of my studies.

Character of the Bleeding.—After uvulotomy, the bleeding, if persistent, is nearly always arterial, as is evidenced by the color of the blood, the spurting of arteries, or the pulsation of the uvular stump. Venous hæmorrhage is, nevertheless, occasionally noticed.

Supposed Risk of Hæmorrhage in High Operations.—Troublesome bleeding is not necessarily attributable to the removal of too much of the uvula (in prolapsus), for a simple clipping has caused profuse hæmorrhage, while an extirpation was nearly bloodless. I should hesitate to apply this opinion to cases of indurated or hypertrophied uvulæ. My practice is to so operate on a prolapsed or hypertrophied uvula as to restore it as near as possible to its normal proportions. Between the two extremes of complete exsection of the uvula and the let-alone system, I think a middle course exists, and can be pursued with the happiest results. No simple operative procedure is more frequently beneficial than a uvulotomy properly done in proper cases.

Hæmorrhagic Diathesis.—The existence of hæmatophilia would have its influence in rendering bleeding persistent in uvulotomy as in other surgical procedures. It is worthy of special note, however, that in none of my collected cases was there a hæmorrhagic diathesis clearly established.

Final Conclusions.—A fatal or uncontrollable hæmorrhage has in one instance followed a uvulotomy.‖

* Tholozan, "Bull. de l'Acad. de méd.," 1884, p. 8.

† "Ann. de la Soc. méd. d'émulation de la Flandre occident.," 1848, p. 250.

‡ Rust's "Magazin," 1823, xiii, p. 276.

"Krankheiten der Uvula," Erlangen, 1843, p. 15.

‖ Read Meyer's extract from the "Knytlingasaga," chap. xvi, 1828, p. 200, given above. Since reading this essay to the American Laryngological Associa-

A persistent, obstinate, or alarming hæmorrhage is only encountered in the rarest instances.

A moderate bleeding, ceasing spontaneously or by the use of mild styptics, occasionally happens.

The loss of a few drops of blood at the time of operating, followed by slight oozing, is of common occurrence.

The most reliable surgical methods for controlling uvular hæmorrhage are the ligature, compression by the clamp or forceps, or the use of the galvano or actual cautery.

The most reliable styptics are, in the order named, solid silver nitrate, or iron persulphate directly applied to the bleeding stump, and solutions of gallo-tannic acid, or alum. To these may be added the local use of ice, ice-water, and vinegar.

The most reliable systemic means are opium, lead acetate, sulphuric acid, and ergot.

Bibliography.

Aetius (Amidenus [or Antiochenus]), "Libri xvi in tres tomos divisi, quorum primus et ultimus Jo. Bapt. Montano . . . secundus Jano Cornario Zuiccaniensi . . . interpretibus Latinitate donati sunt." 3 t. in 1 v., fol., Basileæ, 1535.

Agnew (D. Hayes), "The Principles and Practice of Surgery." 3 vols., 8vo. Philadelphia, 1878–'83.

Albucasis, "De chirurgia. Arabice et latine." Cura Johannis Channing. 3 t. in 1 v., 4to. Oxford, 1778.

Ashhurst (J.), "The Principles and Practice of Surgery." Third edition, 8vo. Philadelphia, 1882.

Avicenna, "Arabum medicorum principis. Ex Gerardi Cremonensis versione, et Andreæ Alphagi Bellumensis castigatione. A Joanne Costæo, et Joanne Paulo Mongio annotationibus iam pridem illustratus. Nunc vero ab eodem Costæo recognitus, et novis alicubi observationibus adauctus. . . . Vita ipsius Avicenna ex Sorsano Arabe eius discipulo, a Nicolæo Massa latine," etc. 2 v. in 1, fol. Venetiis, 1595.

Ballet (Gilbert), "De l'œdème suraigu suffocant de la luette." "France méd.," Par., No. 27, 1885.

Bosworth (Francke H.), "Diseases of the Throat and Nose." 8vo. New York, 1881.

Browne (Lennox), "The Throat and its Diseases." 1 vol., 8vo. Philadelphia, 1878.

Browne (Lennox), "On the Effect of Removal of the Uvula on the Voice." "Brit. M. J.," London, 1880, ii, p. 766.

tion, I have been convinced by research that the case referred to in Dr. Meyer's letter is authentic. I therefore admit the case to my paper.

Browne (L.) and Behnke (E.), "Voice, Song, and Speech." 8vo. London, 1885.

Bryant (Thomas), "A Manual for the Practice of Surgery." Fourth edition, 12mo, 2 vols. London, 1884.

Butcher (Richard G.), "Essays and Reports on Operative and Conservative Surgery." 4to. Dublin, 1865.

Carter (C. H.), "Œdema Uvulæ threatening the Life of the Patient." "Med. News," Philadelphia, 1883, xlii, p. 354.

Celsus (Aurelius Cornelius), "On Medicine," in eight books. Latin and English. Translated from L. Targa's edition, the words of the text being arranged in the order of construction, with explanatory notes, etc., by Alexander Lee. 2 vols. in 1, 8vo. London, 1831.

Cohen (J. Solis-), "Diseases of the Throat." 1 vol., 8vo. New York, 1879.

Cohen (J. Solis-), "The Throat and the Voice." Philadelphia, 1879.

Cooper (Sir Astley), "Lectures on the Principles and Practice of Surgery." Eighth edition, 8vo. London, 1837.

Dartigolles (U.), "Sur un cas de polype muqueux de la luette." "Mém. et bull. de la Soc. de méd. et chir. de Bordeaux" (1884), 1885, pp. 131–133.

Delpech (Jacques Matthieu), "Chirurgie clinique de Montpellier." 2 vols., 4to. Paris et Montpellier, 1825.

Desault (P. J.), "The Surgical Works," etc. 2 vols., 8vo. Philadelphia, 1814.

Dorr (T. C.), "On Amputation of the Uvula as a Remedy for Reflex Irritation." "Am. M. Weekly," Louisville, 1876. v, pp. 113–115.

Druitt (Robert), "The Principles and Practice of Modern Surgery." 8vo. Philadelphia, 1847.

Durant (G.), "Hygiene of the Voice." 12mo. New York, 1879.

Editorial, "Excision partielle de la luette; imprudences multiples; mort." "Union méd. d'Orient," Constantinople, 1880, vii, p. 195.

Erichsen (John Eric), "The Science and Art of Surgery." 2 vols., 8vo. Philadelphia, 1873.

Fabricius ab Aquapendente, "Opera chirurgica, quorum pars prior pentateuchum chirurgicum, posterior operationes chirurgicas continet. Item de abusu cucurbitularum in febribus putridis dissertatio." Fol. Lugduni Batavorum, 1723.

Fournié (Ed.), "Physiologie de la voix et de la parole." 8vo. Paris, 1866.

Fournié (E.), "Complications qui peuvent accompagner la section de la luette; hémorrhagie, angine pultacée." "Rev. méd. franç. et étrang.," Par., 1884, i, pp. 437–440.

Galen (Claudius), "Opera omnia." Ediderunt Andreas Asulanus et J. B. Opizio. 5 v., fol. Venetiis, 1525.

Gant (Frederick James), "The Science and Practice of Surgery. Third edition, 2 vols., 8vo. London, 1886.

Garin (——), "Apoplexie de la luette." "Gaz. d. hôp." Par., 1853, 19.

Gibb (G. D.), "On Diseases of the Throat and Windpipe." Second edition, 12mo. London, 1864.

Gibb (G. D.), "Letter on the Uses of the Uvula." "Lancet," Lond., 1872, i, pp. 180–182.

Gross (Samuel D.), "A System of Surgery." 2 vols., sixth edition. Philadelphia, 1882.

Guenean de Mussy, "Traité de l'angine glanduleuse." 8vo. Paris, 1857.

Heister (Laurenz), "Chirurgie." 4to. Nürnberg, 1770.

Hemming (W. D.), "Throat Diseases," etc. London, 1881.

Hippocrates, "Opera quæ extant. Græce et latine . . . scholiis illustrata, a Hieron. Mercuriali." 2 v. in 1, folio. Venetiis, 1588.

Hippocrates, "Opera omnia quæ extant." In viii sectiones ex Erotiani mente distributa, nunc recens latina interpretatione donata, ac denuo separatim in lucem edita, Anutio Fœsio. Adjecta sunt ad vi selectionem Palladii scholia in lib. de fracturis, nondum, etc. 8vo. Francofurti, 1596.

Holmes (Gordon), "Treatise on Vocal Physiology and Hygiene." London, 1879.

Holmes (T.), "A System of Surgery." 4 vols., 8vo. London, 1860.

James (P.), "Sore Throat." Philadelphia, 1880.

Kleinschmidt (C. H. A.), "Papilloma of the Uvula." "Trans. of the Med. Soc. of the Dist. of Columbia"; "J. of the Am. M. Assoc.," vol. vi, No. 10, 1886, p. 272.

Knytlingasaga, "Kaupmannahafn," 1828, ch. 16, 200.

Labus (Charles), "L'hypermégalie et la paralysie de la luette." 8vo. Milan, 1882.

Knox (R. W.), "The Uvulatome." "Med. News," Philadelphia, 1884, xliv, p. 229.

"Laryngitis after Snipping the Uvula, Laryngotomy, Recovery." "Assoc. Med. Journal," vol. ii, 1857, p. 803.

Lisfranc (J.), "Considérations anatomiques, physiologiques et pathologiques sur la luette." "Rev. méd. franç. et étrang.," Paris, 1823, xi, pp. 233–245.

Lisfranc (J.), "Excision de la luette." "Rev. méd.-chir. de Par.," 1847, ii, 347.

Mackenzie (Morell), "Diseases of the Pharynx, Larynx, and Trachea." 2 vols., 8vo. Philadelphia, 1880.

Malgaigne (J. F.), "Operative Surgery." 8vo. Philadelphia, 1851.

Mandl (L.), "Maladies du larynx et du pharynx." 8vo. Paris, 1872.

Martini (L.), "L'ugola e le sue funzioni." "Osservatore," Torino, 1879, xv, pp. 289–293.

Mesué (Joannes), "De medicamentorum purgantium delectu, castigatione, et usu, libri duo." 2 v. in 1, fol. Venetiis, 1581.

Morgan (E. Carroll), "The Value of the Snare in performing Uvulotomy." "Maryland M. J.," Baltimore, vol. xiii, No. 22, 1885, p. 423.

Morgan (E. Carroll), "Remarks on Papilloma of the Uvula." "Trans. of the Med. Soc. of the Dist. of Columbia"; "J. of the Am. M. Assoc.," vol. vi, No. 10, 1886, pp. 272, 273.

Müller (——), "Manuel de physiologie," 1851.

Nuck (Antonius), "Operationes et experimenta chirurgica." Sm. 8vo. Lugduni Batavorum, 1696.

Oribasius, "Collectorum medicinalium, libri xvii, qui ex magno septuaginta librorum volumine ad nostram ætatem soli pervenerunt." Joanne Baptista Rasario interprete. 16mo. Parisiis, 1555.

Paré (Ambroise), "Œuvres complets. Revus et collationnés sur toutes les éditions, avec les variantes," par J. F. Malgaigne. 3 vols., 8vo. Paris, 1840–'41.

Pauli (——), "Floeser's Repertorium." Tome ii, No. 6.

Paulus Ægineta, "The Seven Books of . . . ." Translation from the Greek, etc. 3 vols., 8vo. London, 1844–'47.

Physick (Philip Syng), Case of obstinate cough occasioned by elongation of the uvula, in which a portion of that organ was cut off, with a description of the instrument employed for that purpose, and also for excision of scirrhous tonsils. "Am. J. of the Med. Sci.," Philadelphia, 1827, i, 262–265, 1 pl.

Pirrie (William), "The Principles and Practice of Surgery." 4to. London, 1860.

Purves (R.), Letter on the Uses of the Uvula. "Lancet," London, 1872, i, p. 271.

Rankin (D. N.), "Excessive Elongation of the Uvula." "Archiv. of Laryngol.," vol. i, No. 2, p. 161.

Rhazes (Abu-Beker-Mohammed), "Opera parva Abubetri filii Zacharie filii Arasi." Sm. 4to. Lugdunum, 1511.

Roux, "Œdème suraigu suffocant de la luette." "J. de méd. et chir. prat.," Paris, 1885, lvi, p. 405.

Rudolph (——), "Blutung aus der Uvula." "Mag. f. d. ges. Heilk.," Berlin, 1823, xiii, p. 276.

Rumbold (T. F.), "The Function of the Uvula and the Prominence formed by the Azygos Uvulæ Muscles." "St. Louis M. and S. J.," 1876, n. s., xiii, pp. 617–627.

Sajous (Charles), "Diseases of the Nose and Throat." 8vo. Philadelphia, 1885.

Schech (——), "Diseases of the Mouth, Throat, and Nose." Blaikie's translation, Edinburgh, 1886.

"Scripta historica Islandorum," etc. Hafniæ, 1842, ch. xvi, 188.

Seiler (Carl), "Diseases of the Throat, Nose," etc. Philadelphia, 1883.

Semon (Felix), "The Throat Department of St. Thomas's Hospital in 1882." 8vo. London, 1884.

Shufeldt, (R. W.), "Two Uvulæ in a Man." "N. York M. J.," 1885, xli, p. 723.

Shurly (E. L.), "A Plea for the Uvula." "Detroit Lancet," Jan., 1881, p. 295.

Smith (E. N.), "Removal of the Uvula." "Brit. M. J.," London, 1872, i, pp. 125, 126, 311.

Spengler (Dr.), "Apoplexia Uvulæ." "Deutsche Klinik," Berlin, 1854, vi, pp. 7, 8.

Susrutas, Ayur Védas: id est medicinal systema a venerabili D'hanvantare demonstratum a Susruta discipulo compositum. Nunc primum ex Sanskrĭta in Latinum sermonem vertit, introductionem, annotationes et rerum indicem adjecit Dr. Franciscus Hessler. 3 vols. in 1. Royal 8vo. Erlangæ, F. Enke, 1844–'50.

Tholozan (——), "Note sur l'excision de la luette par les barbiers persans" "Bull. de l'Acad. de méd.," Paris, 1884, 2 s., xiii, p. 8–10.

Tompkins (W. W.), "Sudden Death, following Excision of the Uvula." "Med. Rec.," New York, vol. xxix, No. 25, 1886, p. 706.

Treves (Frederick), "A Manual of Surgery." 3 vols., 12mo. London, 1886.

Vanoye (René), "Cas rare d'hémorrhagie." "Ann. de la Soc. méd. d'émulat. de la Flandre occid.," Roulers, 1848, pp. 250, 251.

Velpeau (Alf. A. L. M.), "Operative Surgery." 3 vols. New York, 1847.

Voltolini, "Anwendung der Galvanokaustik im Innern des Kehlkopfes und Schlundkopfes." Vienna, 1867.

Voltolini, "Rhinoscopie und Pharyngoscopie." 1879.

Würzburger (Dr.), "Ueber die Krankheiten der Uvula." 29 pp., 1 pl. 8vo. Erlangen, 1843.

Zambaco (——), "L'union méd. d'Orient," Constantinople, No. 24, 1880.

It now becomes my pleasant duty to acknowledge the substantial assistance and advice extended to me during the preparation of this paper by Dr. J. S. Billings, Dr. Robert Fletcher, Dr. Thomas Wise, Dr. J. C. McConnell, Dr. D. S. Lamb, and Professor Apel, of the Surgeon-General's Office, Washington.

Discussion.

Dr. Hooper: I have never seen a bleeding of more than a few drops follow this operation. I never cut through the muscle, but merely remove the redundant mucous membrane. It is with me, however, an infrequent operation—about once in one hundred and sixty-five cases of throat disease.

Dr. Mackenzie: I can not add much to the admirable historical account given by the author of the paper beyond the fact that a record exists of the operation having been performed long anterior to Hippo-

crates and his school. I think that there is in the "Ayur-Véda" an account of the removal of the uvula; they certainly had instruments for the removal of the tonsils, which are clearly described. And I think that they also used the same instrument for the removal of the uvula. It is certain, however, that they removed nasal polypi with the forceps.

Dr. De Blois: An anomalous distribution of the arteries has been assigned as a possible cause of hæmorrhage after staphylotomy, and a case has been reported. I do not think that the arteries alone are at fault. A short time since I saw the two cases which were reported to Dr. Morgan by Dr. Farlow. One was a young girl of sixteen, in whose pharynx the pulsation was noticed, on looking into the throat, behind each posterior pillar of the fauces. The second was a young man, who had a large pulsating artery in the pharynx, involving one side only. It is very curious that both of these patients were seen within a week. Where such a condition of the vessels exists, it is an alarming complication in case of incision for retro-pharyngeal abscess.

Dr. Delavan: I have seen four cases in which this anomalous distribution of the arteries existed, and in all of them it was distinctly marked.

Dr. Donaldson: I was much interested in Dr. Morgan's valuable paper. I am astonished to learn the number of cases of hæmorrhage after the operation. In my own experience I have never had more than a few drops of blood flow. The necessity seldom exists for cutting off the uvula, and the operation should rarely be done. The popular idea that a relaxed and elongated uvula usually causes a cough is erroneous. The chief inconvenience from it is, that it produces difficulty in deglutition by interfering with the ascent of the soft palate. Moura found, as a result of his investigations, that the uvula is of great service in shutting up the chink in the naso-pharynx during the second period of deglutition. This function may be seriously impaired by its removal. It is very seldom that it is necessary to use the uvulatome, and then only a small portion should be excised. Numerous cases have occurred where the uvula has been much enlarged, but where the swelling has disappeared entirely after astringent treatment. The uvula in rare instances descends over the epiglottis.

Dr. Daly: I hope that the paper of Dr. Morgan will be extensively read by the profession, in order to check the tendency of uselessly operating upon the uvula. The aim should be, in any operation, to leave the parts in as nearly a normal condition as possible, and I am, therefore, opposed to a truncate incision in removing the uvula. It should be left in an inverted wedge-shape. I have been very much disgusted with the amount of malpractice which has been perpetrated upon this little organ. In my entire experience of many years of active throat practice I have not found it necessary to amputate the uvula more than three times. That the operation is sometimes necessary I am prepared to admit; but it

should be done as rarely as possible. It has been resorted to by practitioners when they did not know what else to do; under such circumstances it is wrong.

Dr. Morgan: On closing this discussion I wish to express my appreciation of the general approval by the members, and the kind words spoken by the president, relative to the worth of my present essay. My investigation of the question of hæmorrhage following uvulotomy, which has consumed fourteen months, was inspired by a desire to ascertain the facts appertaining to this important and interesting matter; facts which have transpired and, for unaccountable reasons, have never been recorded. The development of the subject under systematic methods has astonished me, as it has others, and a mass of valuable material has ultimately been accumulated. In the investigation of the subject I soon found that medical literature, with three notable exceptions, was silent upon and apparently unaware of the occasional occurrence of dangerous bleeding after uvulotomy, and for this reason I was forced to resort to the circular letter. The responses received from home and abroad were general, and nineteen of the twenty-three cases of hæmorrhage collected are for the first time reported to-day. The utmost caution has been exercised in admitting only undoubted instances of uvular hæmorrhage to the paper, consequently numerous cases have necessarily been excluded. A colleague sent the history of a patient upon whom he had performed a double tonsillotomy and a uvulotomy at one sitting, and expressed the belief though not absolutely certain that the subsequent copious bleeding was from the uvula. For obvious reasons this case has been excluded. I am of the opinion that the errors of omission and commission existing in recent works on diseases of the throat concerning uvular hæmorrhage should be corrected, and the true status of affairs made known. That same scrutiny which has excluded questionable cases from my paper has been exercised in regard to the acceptance of historical writings not duly authenticated, or, in other words, mythical. I do not desire to even disturb the reputation so well deserved by my friend, Dr. Mackenzie, for a knowledge of the antique in laryngology; but I can not adopt as facts the prehistoric and fabulous romances of ancient Indian writers, so vaguely hinted at by Dr. Mackenzie. They have intentionally suffered the fate of exclusion from my literary researches, which cover the period from 400 B. C. to January, 1886, A. D. In the preparation of this paper I have first had regard and respect for the practical in medicine, and subsequently have given what might be considered a fairly exhaustive historical and literary finish. The work has been laborious beyond expectation, and it could never have assumed such proportions but for the unrivaled facilities offered to me by the library of the Surgeon-General's Office. Again, I wish to pay tribute to this library, and to its obliging and accomplished officers.

Paper.

THREE CASES OF THYREOTOMY; RECOVERY IN EACH CASE, WITH EXCELLENT VOICE.

By CLINTON WAGNER, M. D.

THYREOTOMY is indicated in all cases in which distressing dyspnœa is present from laryngeal obstruction, and for the relief of which the operation *per vias naturales* is impracticable. I have no suggestions to offer as to the method of performing the operation, except that I regard silver sutures through the thyreoid, for the purpose of maintaining the divided edges of the cartilage in apposition, after the operation, as quite unnecessary. I employed them in my first two operations, but have since abandoned them. The skin should be brought together by sutures aided by plaster. If this is done carefully and properly, the divided edges of the cartilage will be kept firmly in position, the skin serving as a splint.

In subjects over forty-five years of age I have almost invariably found ossification of the cartilage. A small file-cut wheel, made to revolve by means of the dental engine, will be found in many respects better than the small convex saw generally used; the line of division will be smooth and clean and more easily maintained in the median line, and there will be less difficulty in steadying or fixing the larynx during the sawing process. No evil effects follow the division of the crico-thyreoid membrane and cricoid cartilage; I have usually divided both in my operations; more room or space is gained thereby, especially in very young children, and the growth or membranous web can be removed more easily and thoroughly.

I have performed the operation nine times; with the exception of the three cases which form the subject-matter of this paper, all were for the removal of malignant growths occurring in adults, and the destruction of the vocal cords was a necessary step in the operations.

I do not regard thyreotomy as dangerous to life; hæmorrhage usually is very slight, and can be easily controlled by compression. I can not recall an instance in which I applied a ligature. Fauvel,* however, in one of his operations applied thirty-eight.

* Quoted by Mackenzie, "Diseases of the Pharynx, Larynx, and Trachea," p. 241.

Case I.—Georgie, aged five years, was admitted into the Metropolitan Throat Hospital suffering from alarming dyspnœa, with frequent attacks of spasm of the glottis. An examination revealed a large papilloma attached to the right cord and almost completely filling the box of the larynx, and between the cords posteriorly could be distinctly seen what appeared to be a web of membrane stretched from cord to cord. As the child was greatly reduced in flesh and strength, thyreotomy was at once decided upon. Tracheotomy was first performed, followed immediately by the thyreotomy. The growth was removed, the membranous web cut away with the scissors, and the patient put to bed. The membranous web was the result of an attack of diphtheria or croup, which he had had some months before. The boy recovered perfectly and gained rapidly in strength and flesh; was discharged from the hospital five weeks after the operation.

I saw him six years after the operation. There had been no recurrence of the growth, the vocal cords appeared normal in appearance and action, and the voice was excellent.

Case II.—A boy between three and four years of age was attacked with diphtheria at the Foundling Asylum. Tracheotomy was performed by Dr. G. M. Swift, at that time house surgeon of the institution. The child recovered from the diphtheria, and in due time an attempt was made to dispense with wearing the cannula. Dyspnœa followed and the tube was reinserted. Numerous attempts were subsequently made with the same result. Five months after the tracheotomy was performed, I was requested to give my opinion as to the cause of dyspnœa upon removing the cannula. Owing to the resistance made by the child, I was unable to obtain a very satisfactory view of the larynx. I gave as my opinion that there was laryngeal obstruction, probably a membranous web, the result of the ulceration of diphtheria. I suggested thyreotomy, and was requested to take charge of the case and perform the operation. I found below the vocal cords and just above the inferior border of the thyreoid a membranous web stretched across the larynx and occluding at least the anterior two thirds of its lumen. This was removed carefully by means of scissors and knife, after which I had no difficulty in carrying my index-finger through the glottis into the mouth. The wound healed kindly, twelve days after the operation; the cannula, which he had worn for nearly six months, was removed. Two years later the child, well and strong, with a good strong voice, was sent from the asylum to a home in the West which had been provided for him.

Case III.—A girl child, aged three years, was admitted into the Metropolitan Throat Hospital suffering from alarming dyspnœa with frequent attacks of spasm of the glottis, caused by a large papilloma attached to the left vocal cord. Tracheotomy was performed, but during the operation a large vein was cut, which bled profusely; the prostration from

hæmorrhage was so great that I was compelled to defer thyreotomy for two weeks; it was then performed in the usual manner. The patient was discharged from the hospital at the expiration of two months, but attended my clinic as an out-door patient, and was kept under observation for six months longer.

I saw the patient last in October, 1885, nineteen months after the operation; she was at that time in perfect health, and her voice seemed clear and strong.

Cases I and II were reported at length shortly after the operations ("Med. Record," October, 1879, and "Archives of Laryngology," July, 1883); they are again referred to, merely to show the improvement in the vocal functions after an interval of several years.

The membranous web is a sequel of healing from destructive ulceration of the mucous membrane occurring simultaneously on opposite sides of the larynx. It is not infrequently found as a result of the deep-seated ulceration of tertiary syphilis. In my opinion, it occurs more frequently as a result of laryngeal diphtheria than is generally supposed, although the two cases above detailed are the only instances I have encountered in my practice. I have no doubt it would be frequently seen in laryngeal tuberculosis and cancer could *healing be brought about by any means.* In the adult the web may be destroyed by the galvano-cautery, the laryngeal knife, or Whistler's ingenious cutting dilator, but in very young children thyreotomy is our only means for affording radical relief.

Paper.

THE LARYNGEAL IMAGE AS SEEN IN PHOTOGRAPHS TAKEN DURING THE PRODUCTION OF TONES IN THE SINGING VOICE, WITH LANTERN EXHIBITION OF PHOTOGRAPHS.

By THOMAS R. FRENCH, M. D.

MANY contradictory opinions are held by writers on voice production regarding the appearances of the larynx while producing tones in the singing voice. I am unable to explain the diversity of opinion, except by the assumption that in some instances the facts were incorrectly observed, and in others that many conclusions were drawn from the study of a single larynx, or at least but a few larynges, for the observations are found to be correct in certain classes of cases, but far from correct in many others.

My attention was first called to this subject by the revelations

made in a large number of photographs of the larynx, taken while in the act of producing tones in the singing voice. The statements, therefore, which I am about to make are founded upon careful studies not only with the laryngoscope, but also of many series of photographs. Some of these series I have had mounted and will submit to you for examination, while many points will be illustrated with photographs thrown upon the screen.

Different individuals often employ different mechanisms in the production of the voice, and therefore the appearances of the larynx under similar circumstances are often very different. In studying the anatomy of the larynx, we find that, in the normal state, there are always certain structures, but do we ever find the shape and groupings of these structures in different subjects exactly the same? I believe not, any more than we find the shape and groupings of the features of any two faces exactly alike. The minute differences in the size, shape, and relation of the various structures give rise to some difference in the movements of the parts, and therefore it will be found that no two larynges act exactly alike under similar circumstances. Suppose we compare, with the aid of the laryngoscope, the larynges of two subjects having the same class of voice. In the first place, we find that the relative positions of the parts vary somewhat, and therefore the shapes of the larynges as a whole. We also find that the movements of the various structures in the acts of respiration and phonation differ somewhat. Suppose now that we place a mirror in each of the throats, and examine them at the same time while they are singing the same tone. We find that there is some difference in the positions of the vocal bands. The difference may be marked, or it may be so little that it will be hard to see. But there will certainly be a difference.

It is taught by many writers that certain changes always take place in the positions of the vocal bands at certain notes in the scale as the voice ascends, some asserting that these changes occur suddenly. That certain changes do occur in many larynges while singing up the scale can be easily demonstrated, and some of these will be shown here to-day; but these changes are, I believe, almost always gradual, not sudden. In several subjects whose voices have not been trained, I have detected a slight sudden change in tension of the vocal bands at certain notes, where a break in the voice could be distinctly heard. Though I have looked for it in other untrained voices under similar conditions, a sudden change, if it occurred, was not apparent in the laryngoscopic mirror. In most larynges, what-

ever the peculiarity in the shape of the glottis, in the production of the lower tones of the voice the chink is open widest in its posterior part. In the soprano and tenor, in the production of the middle tones, the chink is usually linear in shape; and in the high tones the chink is open widest in front, and the glottis may or may not be closed behind. In contralto and bass voices, however, the glottic chink may not become linear even in the highest tones. Both by reflected and by transmitted light the vocal bands are seen to be thick and wide in the production of the lower tones, and to grow gradually thinner and narrower as the voice inclines upward. In all larynges the vocal bands are shortest in the production of the lower tones and longest in the middle tones, and grow shorter again in the upper tones.

The variations in the shape of the chink of the glottis as the voice ascends the scale will depend upon the mechanism used by each individual. For instance, if, while producing the lower tones of the bass voice, the chink has an elliptical shape, and the singer has only an ordinary compass, it is apt to continue elliptical throughout the range, though diminishing greatly in size. If, however, the singer has a great compass, the chink may become linear in the upper notes. If, again, there is a well-marked posterior opening in the production of the lower tones, that opening may continue to appear, in gradually diminishing size, in all the tones above. If, again, in the production of the lower tones, the edges of the vocal bands are straight and the chink is open widest in its posterior part, it usually changes gradually into a linear slit which continues through the middle and upper portions of the compass in the male; but in the female, at or about C, treble clef, third space, though it may be as low as F, treble clef, first space, it may change its shape to elliptical for a few tones; but this change is by no means constant, as I shall show in the photographs which will be exhibited on the screen. In the high notes of the female, in the majority of cases, the posterior portions of the vocal bands are brought into contact and the chink is closed from behind forward as the voice ascends. Again, in some larynges, in the production of the low tones, the chink may be open widest in its posterior part, and this portion remain the widest throughout the entire range of the voice. This is well shown in a series of photographs contained in a portfolio which I will submit for examination, showing the interior of the larynx while each note was being sung in a trained contralto voice from D, bass clef, third line, to A, treble clef, first line above staff, or two octaves and a half.

The portfolio also contains a soprano, tenor, and bass series, all of which bear me out in the statement that sudden changes in the positions of the vocal bands, as the trained voice mounts the scale, are rarely apparent.

In the production of the so-called falsetto voice the shape of the chink of the glottis differs considerably in different larynges. A few examples will be shown upon the screen.

The ventricular bands move toward the median line as the voice ascends. In some larynges the space between them is as narrow at certain notes, as in others of the same class, while singing four, five, or more notes above.

When most of the photographs which will be exhibited to-day were taken, the subjects were saying the vowel ē, as in this way the epiglottis is well raised and the interior of the larynx is displayed to the best advantage. In the exhibition of this afternoon it is my intention to call attention to the positions of the vocal bands only.

I will postpone a demonstration of the relative positions of the epiglottis for another occasion, when, after further study, they may be shown in another series of photographs.

I will not at this time express an opinion regarding the registers of the human voice. The study of the voice in this new light has just begun, and a large number of observations must be made before definite conclusions can be reached. The point which I desire particularly to make clear in this paper is that, while it is probable that there are certain laws which apply in all cases to the parts of the vocal bands which must vibrate for the production of certain tones of the voice, no single description of the laryngoscopical appearances which present in the production of tones in any part of either of the classes of voice will suffice to cover all cases. Larynges differ so much in size and shape as to make it impossible for the same conditions to appear in all. The student becomes confused by the differences in the descriptions by different observers, and still more so, perhaps, when he compares a larynx under observation with either of these descriptions. The result is that he often abandons the study, believing it to be a hopeless task. If in this demonstration I can in any degree assist in simplifying this study and in explaining the reasons for the differences in writers' descriptions, my present object will have been attained.

Of the eighteen subjects of whose larynges photographs will be shown to-day, four had received no instruction in singing; these

were used in obtaining the falsetto series; eight had received considerable instruction and six were professional singers. We know that training effects a change in the positions of the various structures of the mouth, pharynx, and upper part of the larynx in the production of tones in singing, but it is difficult to determine whether it also effects a change in the positions of the vocal bands. A series of photographs taken before and after the subject had received a thorough course of instruction would be the only way in which this point could be ascertained. The mechanism is, however, often essentially the same in the production of some of the tones, in the same class of voice, in trained and untrained singers.

In securing the photographs for to-day's exhibition great care was taken to have the force of the blast of air and all other conditions the same.

The paper was illustrated with thirty-seven photographs. As these will not be reproduced at present, the author presents a brief description of their prominent features.

With the exception of the first four, which show types of the larynges of the four classes of voice, all of the photographs were displayed in pairs, as in this way comparisons could be made with greater ease. Two photographs of the larynges of different subjects, but having the same class of voice and while singing the same tone, were displayed at the same time upon the screen, as follows:

Soprano.—No. 1. While singing D, treble clef, first space, below staff. The first of the pair shows the vocal bands to be quite long and narrow, and the chink of the glottis open widest behind. In the second the vocal bands are wide and short, and the chink is linear in shape.

No. 2. Singing C sharp, treble clef, third space. In one the chink is elliptical, the vocal bands being bowed slightly outward. In the other the bands are bowed inward, the chink being open widest in front and behind.

No. 3. Same note as No. 2. In the first the vocal bands are long and narrow, and the chink is open widest in front. In the second the bands are short and wide and the chink is linear.

No. 4. Singing D, treble clef, fourth line. One shows the vocal bands to be bowed outward, while in the other they are bowed inward.

No. 5. Singing E, treble clef, fourth space. In one the edges of the vocal bands are parallel. In the other the chink is much narrower in the middle than in front and behind, the edges of the bands being curved inward.

No. 6. Singing A, treble clef, first line above staff. This is one of what are known as head tones. In the first photograph the vocal bands are seen to be bowed inward and are in contact in the middle, leaving

narrow slits in front and behind. In the other the glottis is closed behind, leaving a narrow slit in front.*

No. 7. The last photograph of the soprano series shows the larynx while singing C above the high C, eleven tones above the treble clef. The vocal bands are very short and extremely narrow. The bands are in contact behind, there being a short and very narrow slit in front.

Contralto.—No. 8. Singing E, bass clef, third space. In both larynges the bands are short and wide; the chink is closed as far back as the posterior vocal processes, behind which there is a small triangular opening, which is much larger in one than the other.

No. 9. Singing G sharp, treble clef, second line. In the first the vocal bands are wide and long. The chink is linear as far back as the posterior vocal processes, behind which it widens out into a small triangular opening. In the second the bands are also long. Their edges are straight but not parallel, the chink being open widest behind.

No. 10. Singing F sharp, treble clef, top line. In one the vocal bands are short, quite narrow, and their edges are parallel and close together. In the other the vocal bands are long—nearly twice the length of the first—and wide, the chink being open widest behind.

Tenor.—No. 11. Singing E, bass clef, third space. In one the chink is open widest in front, while in the other its widest part is behind.

No. 12. Singing F sharp, treble clef, first space. In one the glottis is closed behind and open, in a narrow slit, in front. In the other the vocal bands are longer, and the chink is open in its entire length, being linear in shape.

Bass.—No. 13. Singing E, bass clef, first line below staff. The first shows the vocal bands to be short and quite wide. The interligamentous portion of the glottis is closed. A small diamond-shaped opening presents in the intercartilaginous portion. In the second the vocal bands are shorter and narrower, and their anterior two thirds are in contact. There is a triangular opening behind, but this is in the interligamentous portion of the glottis. The intercartilaginous portion is closed in this larynx. The entire length of the vocal bands can be seen in both larynges.

No. 14. Singing B, bass clef, second line. In one the vocal bands are long and wide. The posterior vocal processes are in contact, leaving a short elliptical slit in front and a small round opening behind. In the other the bands are not more than half as long, much wider, and there is an oval opening in the posterior portion of the chink. The vocal processes are not seen in this larynx.

* In a series of photographs of the larynx of a soprano singer, while singing so-called head tones, taken at the residence of a Fellow in Philadelphia on the day after this paper was read, and in the presence of a number of Fellows and others, who judged of the purity and accuracy with which the tones were produced, the glottic chink is seen to be open in its entire length, though a trifle wider in front than behind. The edges of the vocal bands are perfectly straight.

No. 15. Singing C sharp, bass clef, first line above staff. In both larynges the bands are long and narrow. The chink is open widest behind in both, though much wider in one than the other.

"*Falsetto.*"—No. 16. Singing A, bass clef, fourth space above staff. In the first the chink is open in its entire length, but wider in front than behind. In the second there is an oval opening in the middle, the glottis being closed in front and behind.

No. 17. Same note as No. 16. In one the chink is open widest in the middle and behind, the space between these portions being nearly closed. The glottis is closed in front. In the other the vocal bands are long and narrow and the chink is open in its entire length. It is linear as far back as the posterior vocal processes, behind which there is a small triangular opening.

In concluding, the speaker said that the display must at least prove that there was a variety of mechanisms by which the same tones might be produced by different larynges in either of the classes of voice.

Discussion.

The PRESIDENT: I wish to express my admiration of the photographs just exhibited by Dr. French. The question must be asked, Do not the variations in which the same note is formed in different persons in some way relate to other parts of the economy than the larynx? Do not the velum, the resonating chambers, and the epiglottis enter into the formation of the singing tones as well as the vocal bands? I would venture to make the suggestion that the quality of the tone be recorded with the image. It is true that the judgment as to the value of the musical tone is a critical one and can not be made a part of the scientific method; but I can not avoid the conclusion that some of the differences figured by Dr. French were coincident with the fact that some of the forms photographed were from individuals who, while reaching the desired pitch in the tones, did so at the sacrifice of musical quality.

Dr. SEILER: The president has expressed my own view in this matter. The photographs shown do not represent or furnish anything definite with regard to what is known as the registers of the voice, and every trained musician will recognize variations in the tone of the voice, which are known as the registers of the voice, which can not be revealed by the laryngoscope, or any instrument whatever. I have noticed in the photographs variations in the chink of the glottis in producing the same tones with different larynges; it was stated that the chink of the glottis in some was altered in shape during the production of a certain note by the mere fact of an increase of the air-pressure. Dr. French does not tell us how much pressure of air in the lungs accompanies each position, and we do not know how much of the change is attributable to the tone, and how much may be due to variation in shape of the chink of the glottis, posteriorly or anteriorly, in order to allow the extra blast of air to escape.

Moreover, the photographs do not show the difference in the quality of tone in notes of the same pitch. This is to some extent controlled by the resonant cavity; otherwise one man could not imitate the voice of another, or imitate the cry of an animal. Therefore, they do not teach much about the musical quality of the voice or tones of what is called the register. In conversation with Madame Seiler, she expressed the opinion, after seeing these photographs, that only one out of twenty female voices could produce the head tones properly without instruction; they generally force the higher notes instead of singing them naturally. For instance, I recall the fact that there were a number of female singers connected with the German, Italian, and American opera who were in this city last winter, only one in three of whom truly possessed the head tones; the others forced the head notes by air-pressure. This difference between the natural and forced production of tones produces a variation in the quality of the tone which is readily recognized by the unaided ear of persons trained in music. Now, take one of the cases referred to and put a mirror in the throat, and it will not show the difference which is so promptly detected by the ear. In fact, with a mirror in position, it is not possible for the head tones to be produced under ordinary circumstances, or without previous training. It is only by the reciprocal action of the air-chambers and the larynx, the former modifying the vibrations of the sounds produced by the latter, that the head tones are formed. This is well illustrated in the production of the trill, which is the result of tuning the resonant chambers by voluntary effort one half-note above the note produced by the vocal membranes. When this is done, the voice will trill backward and forward between the tone of the larynx and the resonant chambers. The manner of the formation of the trill I accidentally discovered when a boy by attempting to whistle into a long tube or blow-pipe. I found that when I whistled the fundamental note, or its harmonic, I succeeded in producing an uninterrupted sound. I then tried to whistle half a note higher than the fundamental tone, and found, after repeated trials, that I could not produce a clear tone, but made a trill. The inference was made that the same thing occurred in the human voice when a trill was produced, hence I formed this theory as an explanation of the trill in singing.

I have stated that the photographs take no account of the vocal register. Now, this register may be changed in various ways. Referring to the photographs of the larynx in a position to form the bass notes, which have just been shown, I would say that you may have a bass singer who, in singing a note, produces a sound in which can be heard the rattling of the vocal cords and noise of escaping air—what is called a straw bass; or you may have the same tone produced soft and mellow. I conclude, from the great difference in the sound, that the photographs of the larynges during the production of these sounds would be different. In the first case the glottis would be widely open in its posterior part and in front, while the bands would approach each other in the center; whereas, if the

tone was produced in a soft, mellow way, as it ought to be, the photograph of the larynx would show only a linear or elliptical opening in the glottis —that is to say, the membranous portion of the glottis would be nearly closed, and the cartilaginous portion would be closed entirely, or, in other words, the sound would be produced as described by authorities generally.

Dr. French deserves more than a mere vote of thanks for the labor, ingenuity, and perseverance he has displayed in this line of research, and, if he continues, he will certainly reach the goal of his ambition. I hope, however, that he will also devote some attention to the register of the voice, and train his ear to recognize changes in tone, so as not to depend entirely upon the laryngoscope to show differences in the quality of tones.

Dr. Delavan: I would like to ask the last speaker to define his position with regard to the registers of the voice. Some music-teachers say that there is no such thing as a register, while others claim that there are any number up to seven, hardly any two holding the same view.

Dr. Seiler: In every voice which has not been cultivated, what Dr. Langmaid calls a normal voice, there is a certain division, in ascending or descending the scale, which can be recognized by the ear. For instance, there are certain features which all kinds of voices have in common, and that is a difference between the chest notes and the head tones; there is a break where one ends and the other begins. This is expressed by the term "register," which is borrowed from the organ, where we have the oboe, the flute, and other registers. The difference is not in the pitch, but in the quality of the tone. It is true that there are good authorities who deny that there is such a thing as a register in the human voice, but they beg the question merely by calling it by some other name. Merkel, I believe, goes so far as to say that he distinguishes between the true voice and the false voice. In fact, all musical authorities agree in admitting that there is a difference between the quality of musical sounds produced by the singing voice, whether they call it register or something else.

Dr. Langmaid: It is very interesting to find that in this association, after the reading of such a paper as we have just heard, the president and the fellows join in an intelligent discussion of the subject presented. I think that Dr. French has begun right. He has given merely the observed facts without any theories; he has not spoken of the action of muscles, or of resonators, or of the formation of tones; but has simply given photographs showing the appearances of the vocal cords when producing notes of a certain pitch. I merely wish to reiterate opinions expressed in a paper read some years ago. The preceding speakers have expressed my thought, that the perfectly normal formation of voice is a rare thing; a perfectly normal tone is rare, and in the same voice there are variations, which may be called abnormities, one part of the voice being produced properly and in an economical way, and another showing a waste of force and of air so that the note is extravagantly produced. This was illustrated

in one of the photographs exhibited by Dr. French, where, instead of the long narrow chink which he expected to find, he saw a short, rather elliptical opening.

I have no doubt that, if I should ask Dr. French if he had not recognized differences in quality of tone corresponding with variations in the shape of the glottis, he would answer, Yes. But in his communication his statements were very guarded. He did not tell us that the tone produced by a contralto voice, in singing a certain note, was the same in quality as that produced by a soprano at the same pitch, but I have no doubt that, if he were to formulate his opinion, he would say, as Dr. Seiler did, that he could tell, by looking at the glottis, the quality of the tone. I think he could, I know that Dr. Seiler could, and I know that I could.

It has been observed that the shape of the glottis is not constant in the formation of certain tones. There is a variation in the force of the wind-blast, which affects the shape of the glottis, as Dr. French has graphically shown, so that, if a singer makes a note in the easiest manner, he forms a definite opening between the vocal bands; on the other hand, if he should use a greater wind-blast, the shape would be modified to accommodate the greater pressure. The books do not show this; they only give one position for each note. I hope that Dr. French will go on and follow up his investigation of what takes place, and not do as Dr. Seiler has suggested—formulate a theory of the formation of tones.

Dr. French: I have already occupied so much of the valuable time of the association that I will add but a few words. A very large amount of work must be done in this direction before such questions as have been brought up in the discussion can be definitely settled. The display of to-day covers only a small portion of the field, and I have but complied with the agreement which I made, which was that I should show the results of the work as far as I had gone. As Dr. Langmaid has observed, I have advanced no theories, but simply presented facts. All books on the voice, and most text-books on diseases of the throat, contain descriptions of the laryngoscopical appearances in the production of the voice. But why do these descriptions differ? An attempt to answer this question was the main motive for the presentation of my paper and photographs to-day. I have said nothing whatever about resonant chambers, registers, or quality of the voice. On some future occasion I hope to be able to throw some new light on these subjects.

Paper.

PROLAPSE OF THE LARYNGEAL VENTRICLES.

By G. W. MAJOR, M. D.

PROLAPSE of the laryngeal ventricles, though of somewhat rare occurrence, is much more frequently met with than eversion. It may be as well here to insist upon the need of discriminating between these two conditions, and thus avoid misconception. In deciding upon the term to be applied to a given case, we are of necessity influenced by the extent of displacement. If we were, however, to more carefully consider whether eversion, in its literal sense, were present, we should no doubt be more accurate in our observations. In other words, prolapse does exist without eversion of the sacculus, while eversion can not occur without prolapse having been a factor for some period, however brief, in its development. On the other hand, prolapse may vary very much in degree, from merely filling the laryngeal orifice of the ventricle to dimensions sufficient to entirely destroy voice production and seriously embarrass respiration.

After the articles on this subject by Moxon, Morell Mackenzie, Lefferts, Massei, Waldenburg, Gruber, J. Solis-Cohen, John N. Mackenzie, and Elsberg, literature so familiar, it would be but mere repetition to go into a detailed general statement of the conditions so minutely described by these authors as met with in displacement of the ventricles.

Five cases in all have been seen by the writer: two of these examples of eversion, and three of simple prolapse of varying extent.

Case I.—W. W., aged twenty-five, railroad clerk. His family history is good; father died of paralysis, aged sixty-two years; mother living, aged fifty-five. In all, ten children were born, eight still living, varying in age from seventeen to thirty-three years, while two died in infancy.

In March of 1883 the patient contracted a bad cold, accompanied by severe cough, but is quite positive that his voice was not then affected. In May of the same year he consulted his usual medical attendant about his condition, and was prescribed an ordinary linctus. In the following June hoarseness *gradually* developed, and continued with aggravation up to the time of his first visit.

On January 30, 1884, when he came under notice, there was evidence of impaired general health, speaking fatigued him, produced local irritation, and provoked fits of a dry, rasping cough. In walking his breath-

ing was difficult, and altogether the man presented the appearance of one whose air-supply was less than normal. His voice was almost extinct. On examination, the larynx and surrounding parts were found to be intensely congested and the arytenoid bodies swollen.

On full inspiration, the right vocal cord was found discolored, thickened, and eroded, and was visible throughout its length, but not its breadth. The line of separation between the cord and the ventricular band was absent, but its situation was occupied by a red flesh-like roll of almost equal dimensions throughout its course.

The left vocal cord, on full inspiration, was invisible through its entire length, and its field was covered by a fold of red tissue tapering at either extremity.

On phonation, these bodies retracted somewhat, meeting, however, at their central point, gradually shading off anteriorly and posteriorly, and having small triangular spaces with the apices directed inward, through which the vocal cords were with difficulty visible.

On attempting a high note, the displaced ventricles were forced still farther apart, the ventricular bands advancing, in order, as it were, to re-enforce the vocal cords. A chest examination detected no signs of pulmonary disease. There had been a progressive loss of weight and strength.

Local treatment was carried out steadily for sixteen months, with satisfactory results, as far as the general condition of the larynx was concerned, but with little material improvement to the prolapsed ventricles.

In May, 1885, treatment was omitted for four months, owing to the writer's absence in Europe. The patient followed out his instructions either ineffectually or unfaithfully, for, when he was examined in October of that year, a large mass, presumably tuberculous, had developed on the laryngeal face of the right arytenoid, extending somewhat into the commissure. The lungs also showed well-marked signs of deposit, while the general health had greatly suffered.

Under careful treatment, this mass has since almost entirely disappeared, the ventricles still retaining their abnormal position.

This case was exhibited at the last fortnightly meeting of the Medico-Chirurgical Society, at Montreal, in April of this year.

Case II.—Mrs. R., an old subject of specific disease, had been under observation some years previously for caries of the jaw. This woman was admitted into the Montreal General Hospital in an insensible condition, with well-marked convulsive movements of the right side of the body. After partial recovery, her attendant requested a laryngoscopic examination to account for aphonia and stridulous breathing, evidently suspecting a central lesion as the cause. The right sacculus was found completely everted, and protruded beyond the median line. This accident must have occurred during the eclampsia, as previously, though her

voice had suffered from old laryngeal syphilis, there had been no difficulty in breathing. Post mortem, the right wing of the thyroid showed signs of old disease, and the ventricle was found completely everted.

Case III.—H. D., aged thirty-two, a cab-driver, contracted syphilis in October, 1874, and had remained under treatment for several months.

On February 11, 1884, he applied for relief for aphonia and attacks of suffocation. On examining the larynx, there was noted eversion of the right ventricle which covered the corresponding cord completely on quiet respiration, and on full inspiration protruded far beyond the median line. On attempted phonation, it receded somewhat within the ventricular opening.

On examining the scalp, large syphilitic ulcers were found.

Astringent sprays were applied locally, and full doses of iodide of potassium, increased *guttatim*, were ordered. During the six or eight weeks that the patient remained under observation some slight improvement followed. The man passed from under notice, and was not again seen until the 29th of April, 1885 (rather more than a year afterward), when sent for for purposes of class demonstration. The ventricle was found to have *spontaneously* reposited itself, and but very slight traces of prolapse existed. He stated that, shortly after his last visit, he had contracted acute articular rheumatism, and during the illness the breathing had gradually improved; the voice, however, owing to chronic catarrhal causes, still remained hoarse. This case seems remarkable, if not unique, and mainly induced the publication of these records.

Case IV.—M. B., a railroad contractor, came under treatment last winter for laryngeal stenosis. He had contracted syphilis eighteen years before; in the course of the disease his larynx was involved, and he had been aphonic ever since. On examination, the left vocal cord was found wanting, and a small, pale, pink roll (prolapse) above its level represented it. The voice, such as it was, was produced by the ventricular band of the affected side, probably assisted by the prolapsed ventricle.

Case V.—T. P., aged twenty-nine, barber by trade, a subject of pulmonary tuberculosis, was referred from the wards of the Montreal General Hospital during the past winter for examination and report. There were laryngeal signs of tuberculosis and commencing ulceration. Both laryngeal ventricles were found prolapsed, obscuring the vocal cords through four fifths of their breadth. Applications of a weak solution of chloride of zinc, and insufflations of iodoform, morphine, and gum acacia gave decided relief.

In deciding upon the character of these cases, the means employed were palpation and ability to replace with a laryngeal probe, as well as the observation of partial retirement on phonation. Some of the cases reported as prolapse have been, in point of fact, cases of eversions proper. The terms prolapse and eversion have been, to some extent at

least, used synonymously, and hence the creation of some confusion. The conditions which favor displacement, if we exclude pressure from without from whatever cause, the violence of coughing, and that of spasmodic attacks, seem to be various constitutional states which play an important rôle in its production. In the five instances under consideration, three examples occurred in individuals of syphilitic habit, while the remaining two were in subjects of tuberculosis.

Among the cases previously recorded by the authorities before named, cancer, tubercle, syphilis, or chronic catarrhal conditions prevailed.

Paper.

A NOVEL PROCEDURE FOR THE REMOVAL OF SUBGLOTTIC LARYNGEAL GROWTHS, WITH THE REPORT OF AN ILLUSTRATIVE CASE.

By WILLIAM CHAPMAN JARVIS, M. D.

IN view of the numerous treatises on laryngeal growths which have appeared in print within the memory of laryngoscopic and even in pre-laryngoscopic times, it is reasonable at this period to expect something more than the customary recourse to a unique pathological condition as an ample basis for the presentation of another monograph. A careful study of the literature of the subject shows that cases similar to the one explained in the title of my paper, supplemented by the successful eradication of the neoplasm, have heretofore been considered sufficient reason for the elaboration of interesting essays.

It is only fair to state that these reasons—and an additional feature possessed by my case, namely, a novel, safe, and easy method of procedure, affording an exceptional opportunity for forming deductions concerning the question of laryngo-fission—are the data which principally prompted the preparation of this paper. It may be well to add that the term subglottic employed by me is taken in its restricted sense as applied to neoplasms attached entirely below the level of the lower cords.

The circumstances attending my relations with the patient whose history and treatment constitute the subject of my remarks, as drawn from my case-book, are substantially as follows:

On March 22, 1882, J. C., a cooper by trade, aged thirty-five, consulted me through the advice of Dr. M. J. Roberts, of New York, as a charity patient, for relief from a difficulty in speech and breathing. The change in his voice was first noticed within the last two years. Difficulty

in breathing commenced about a year ago, and has gradually grown worse. There has never been any cough. His general health is excellent.

Examination.—The patient's voice has the character of a raucous whisper, resembling somewhat the sound produced by contact of the hypertrophied ventricular bands of chronic laryngitis in attempts made to phonate distinctly.

A laryngoscopic examination demonstrated the presence of a mass of papillomatous tissue which, during the act of speaking, could be seen covering the anterior margins of the vocal cords. A quiet inspiration made it possible to observe the papilloma occupying the cavity of the larynx, and also showed that the vocal cords and ventricular bands were not involved. I advised removal of the growth through the mouth. An attempt was made to seize it during phonation first with a Cusco forceps, but, not succeeding in this, and fearing that the sound structures might be accidentally injured, I discarded this instrument for Mackenzie's forceps. I succeeded in dragging away several small pieces with the last-named instrument, of about the size of a wheat kernel. Even this instrument, which has yielded such excellent results in the treatment of supra-glottic growths, was eventually abandoned as constituting a menace to the integrity of the neighboring healthy tissues. This liability to injure the peri-laryngeal structures was rendered greater by reason of the irritability of the individual's throat. To add to this difficulty, the tongue of the patient exhibited a most persistent tendency to rise posteriorly, and by this motion partly blocked up the entrance of the fauces. Although I succeeded in removing the lingual obstruction by training the patient to grasp his tongue and then depressing it, I still had to contend with a most tantalizing state of pharyngeal irritability. Sometimes I boldly forced the slender blades of the forceps directly between the contracted cords, and by this manœuvre succeeded in removing the small fragments already referred to.

Mindful of the absolute safety with which my wire écraseur can be operated in the nasal and pharyngeal cavities, I naturally resorted to it in my dilemma. I was, however, doomed to disappointment, for, despite the assiduous employment of several grades of piano-wire and the exercise of great caution in its introduction, the loop was seized and displaced by the violent involuntary contraction of the laryngeal and pharyngeal constrictors. I then had recourse to my chromic-acid applicator, hoping to obtain some of the excellent results already related to you in the history of a patient presented to this society (1884), and which has given good results in the hands of others since the publication of the paper.

On May 20th I succeeded with great watchfulness in projecting the prepared probe across the interval of greatest irritability directly upon the growth. Blanching of the surface of the growth proved my aim was true. The shedding of the eschar followed in due time. I soon,

however, discovered that it was impossible to confine the applications to the surface of the neoplasm because of its intra-laryngeal situation, and therefore abandoned this method, fearing that it might provoke the acute œdema which is apt to follow the action of this caustic when applied to loose folds of mucous membrane.

Further planning was rendered temporarily unnecessary by the disappearance of my patient.

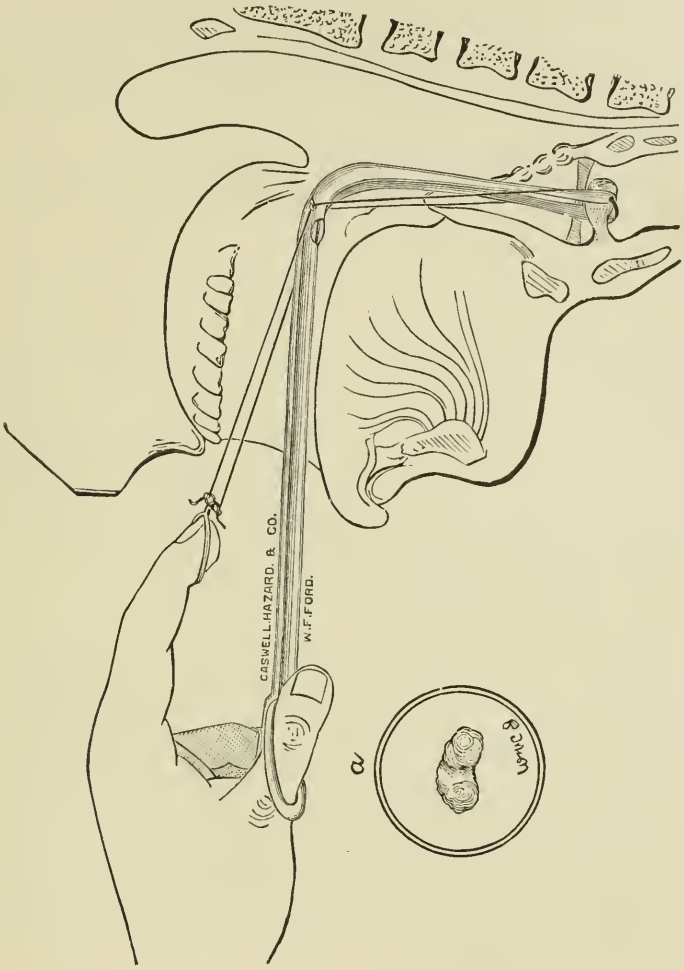
In March, 1884, more than a year after his last visit, the patient consulted me again. His appearance had undergone a marked change in this time. His face was haggard and emaciated. Respiration was labored and clearly inadequate for the requirements of the individual. His efforts to speak were painful to witness, a coarse, muffled whisper or rattling sound being the usual result. He stated that after a hard struggle he had at last been compelled to give up work, and the problem of maintaining his much-dependent family served to increase his general misery. I realized that prompt relief in his dangerous condition was demanded, and consequently proposed to remove the growth by opening the windpipe. Willing, however, to grant him every opportunity of escaping this troublesome alternative, I, with his cheerful consent, endeavored to remove the growth which threatened his life while under the influence of a general anæsthetic. Suffocative symptoms, however, occurred before an effort to remove the growth could be attempted.

At this stage of my hitherto ineffective efforts the idea occurred to me that a device which would enable me to introduce a loop of piano-wire in such a manner as to prevent its displacement while within the larynx would enable me to encircle the neoplasm and tear it from its attachment.

Appreciating, in the first place, that an instrument would be needed possessing slender but powerful blades, I selected a stout Mackenzie's forceps, and had it modified to suit the several requirements. The biting portion of the blades was smoothly rounded, to prevent the tissue being seized by its points or sides. The points of the blades were also shaped like a wedge, in order to facilitate their introduction through the vocal cords (see figure), should these be in a state of spasm. Four openings were drilled through the ends of the blades, to serve as guides for the fine piano-wire. The diminutive rings placed at intervals along the arms of the forceps were to conduct the wire and prevent it from coming in contact with the mucous membrane of the throat. In mounting the instrument, the ends of the wire, carried through the eyes and ring-guides, were made to enter a binding screw. The instrument was grasped between the thumb and third finger, the index-finger being left free to manipulate the guide-ring.

On March 7, 1884, I first operated with this improvised laryngeal snare and successfully removed a papilloma (from the cavity of the

larynx, in its entirety). My method of procedure was as follows: The forceps, properly armed with a strand of No. 00 wire, was well lubricated with vaseline and guided toward the glottis by means of the la-



ryngoscopic mirror. The persistent reflex spasm occurred as usual, but was for the nonce disregarded, and the point of the forceps boldly projected held upon the powerfully contracted cords. The laryngoscope was now withdrawn and the patient was desired to inspire; as he did not respond to the request, the point of the forceps was firmly pressed by a wedge-like motion directly between the gasping structures and

carried far down within the cavity of the larynx. The blades were then separated, a feat requiring the employment of considerable force, and drawn upward over the left lateral wall of the larynx, the inferred point of the growth's attachment.

Just before the forceps left the larynx, a slight resistance in the upward sweep of the instrument was felt, and, the blades being promptly closed, a tearing sensation was conveyed to the fingers. The papilloma came out, clinging to the blades of the instrument. Breathing was at once rendered easier.

The patient, in answer to an inquiry, declared that the presence of the forceps had not been at all painful, a reply which one might expect on contemplating the small size and smoothness of the blades of the instrument.

Laryngoscopic inspection now revealed the presence of another subglottic papilloma, lying below the left vocal cord. A repetition of the procedure resulted in the removal of another papilloma of about the size of the first. The patient spat up a few flakes of blood mixed with mucus. On examining the larynx, I discovered the site of the growth was marked by a circumscribed clot, well within this cavity. The larynx and trachea were perfectly free, and all the familiar outlines were perfect. For the first time in three years the patient broke forth into speech, giving vent, in a loud and clear voice, to expressions of delight. An idea of the size of the growths may be obtained from the figure, in which one is shown graphically reproduced by compass measurements.

May 30, 1884.—Could discern no marks left by the growth in the larynx. Patient has been talking and singing all the week.

The successful removal of these subglottic growths in the manner just described, when thoughtfully reviewed, will be observed to aid in the establishment of several important but as yet unsettled questions. Two points, it seems to me, demand more than a mere mention—namely, the feasibility of extirpating laryngeal tumors by means of an instrument which can be safely and efficiently manipulated without the aid of vision, and even then offer advantages over the many piecemeal methods; and, next, the avoidance of the more serious and troublesome procedure almost universally recommended and employed in these cases—the removal of these growths through an opening in the neck.

Returning to the first proposition, I do not desire to be considered as totally condemning any of the various methods generally employed for the removal of laryngeal growths. These as a rule have found a proper place, yielding good results in the hands of their advocates.

A detailed description of the conditions indicating the employ-

ment of the snare-forceps need not detain us here. The multifarious forms and positions assumed by laryngeal growths naturally require increased resources in the choice of instruments and methods. It would, for instance, have been highly inadvisable for me to attempt to remove the exuberant papilloma reported to this society two years ago as cured by my chromic-acid procedure.* In this case the respiratory space was not much larger than a quill, and this was associated with inspiratory spasm of a most serious character. Instrumental interference in this case proved exceedingly hazardous, and its practice was therefore unjustifiable. These cases, however, are reported as infrequent.

The deliberate introduction of the forceps-snare between the vocal cords, while in a state of violent contraction, deep within the cavity of the larynx, demonstrates that the popular impression of the impassability of the glottis in a state of spasm is untenable. The operator must, of course, first satisfy himself that the respiratory slit is sufficient to permit spontaneous recovery from the spasm necessarily provoked. The small amount of space required for this purpose is surprising when we consider the extent of the growth, which nearly filled the larynx in the case just reported.

The question of rendering the glottis viable by the use of cocaine will naturally suggest itself to the minds of a few. While not unmindful of the usefulness of this anæsthetic in cases of irritable throat, I am not the less convinced, from my experience with sub- and supra-glottic growths since the treatment of the case, that it would have proved provokingly inefficient.

The credit of the earliest employment of the snare in laryngoscopic surgery clearly belongs to Dr. Walker, who describes a modified Gooch's cannula, in the London "Lancet" of 1861, by means of which he partially succeeded in removing a laryngeal growth. Gibbs followed with his exposed-wire snare, working on the Wilde principle, by the assiduous employment of which, in conjunction with chloroform anæsthesia, he succeeded in dragging out several laryngeal growths.

Gibbs's conclusion—that the various caustic and cutting methods ranged against his own are to be characterized, in his own words, as "a pecking-away system," liable to generate malignant disease—seems to me rather overdrawn. As regards these and Moura-Bourouillou's spiked snare, I have already shown that the exposed wire can

* "A New Method for the Removal of Laryngeal Growths," "N. Y. Med. Jour.," August 23, 1884, p. 206.

not be properly manipulated in the larynx or lower pharynx, by reason of its liability to become displaced by reflex contraction. In taking this view I am supported by several well-known workers in this operative field who have sought to overcome the defect by the use of rigid rings, which protect the fine wire. The very arguments advanced by the originators of these devices, though intended to be taken as commendatory, show the instruments to be of limited service in the treatment of subglottic laryngeal growths by the natural method, and of little value for the removal of supraglottic neoplasms. An objection raised by several writers against laryngeal snares is the danger of the growth becoming detached from the loop and dropping into the larynx. The possibility of this accident occurring is most satisfactorily prevented by the snare-forceps, since the neoplasm is tightly grasped by the blades of the instrument.

I shall conclude my remarks with a brief reference to the second proposition—namely, the substitution of the harmless method offered by the snare-forceps for the more serious and troublesome practice of opening the wind-pipe, heretofore largely adopted in these cases. A retrospective glance at the literature of the subject demonstrates the fact that the first impulse generated by the discovery and intelligent employment of the laryngoscope was characterized by a praiseworthy effort to reduce the previously accepted indications for operation through artificial openings to the fewest possible number of cases. Indeed, no single factor appears to have contributed so much to the development of laryngology as a special branch of medicine as the meritorious effort to substitute natural methods of treating laryngeal obstruction for the so-called artificial measures of general surgery.

In pre-laryngoscopic times, intra-laryngeal growths were always removed from without. Immediately after the discovery of the laryngoscope, neoplasms within easy reach were eradicated through the mouth, and the development of laryngoscopic surgery emboldened the laryngologist to remove complicated neoplasms and to ultimately extend his operations into the cavity of the larynx. The last, it is true, is rarely performed, but I believe it will become more popular as our operative resources increase.

In 1884 I presented the history of a patient from whose larynx a difficult papilloma had been successfully removed by my chromic-acid method. I laid particular stress upon the fact that the signal success which followed this operation served to contract the indica-

tions for tracheotomy, for in the preliminary examination of this case I had agreed with several consultants that this was the only treatment positively promising any amelioration or cure. The satisfactory results obtained in the treatment of the subglottic papillomata by the natural method just described, it seems to me, must contract the indications for the artificial method to a still greater extent.

Although the foregoing deductions, based upon two cases in my own practice, and the literature of the subject, may appear rather positive, they are nevertheless the outcome of mature and conscientious deliberation, and as such I shall unhesitatingly act upon them in the future; I therefore trust you will, either by the employment of similar measures or any method you may prefer, endeavor, with me, to reduce the frequency of operations on the neck for the removal of the simpler forms of laryngeal obstruction.

Discussion.

The President: I am happy to compliment Dr. Jarvis upon his achievement. He has with his snare successfully removed growths from the nasal chambers, from the pharynx and larynx, and now has succeeded in removing a growth from below the vocal bands.

Dr. Hooper: What was the exact situation of the papilloma?

Dr. Jarvis: My statement that it was situated just below the left vocal band was based on the fact that after its removal a hæmorrhagic spot was distinguishable in that situation. It is really impossible to say where it originally sprang from, as there were several growths with different points of attachment. It is certain, however, that the entire mass was below the vocal bands.

Dr. Hooper: The problem in removing a papilloma is to grasp it; after that there is no difficulty—it may be easily torn away. If this one was situated below the cords, I can not understand why there should have been any difficulty in removing it with the Mackenzie forceps. What is the special utility of the snare?

Dr. Jarvis: I have already stated that with the Mackenzie forceps I did succeed in removing a minute portion of the growth. There existed a marked tendency on the part of the laryngeal muscles to contract instantly and powerfully, even before the instrument reached the cords, which, while it did not prevent my inserting the Mackenzie forceps within the larynx, nevertheless made it difficult and even dangerous to the integrity of the soft parts to expand the narrow blades within the larynx. My efforts in this direction were only rewarded with discouragement and the temporary disappearance of the patient.

Dr. Sajous: It seems to me that in this case the wire did not act as a snare; the forceps removed the growth, and the wire acted more as a guide than as a snare. There can be no question but that by means

of the wire the operator was able to ascertain that his instrument was on a level with the tumor and not above it, and that, through the use of the wire, the growth was simply brought into the bite of the forceps.

Dr. Jarvis: Despite the view expressed by Dr. Sajous, the fact remains that without the wire it was impossible to remove the growth. When the forceps alone was employed, its biting portion evidently either did not touch the papilloma or, the blades thrusting it aside, merely grazed it. The wire loop, however, not only played the part of a searcher, it embraced the growth in substantially the same manner as any snare would. The blades of the forceps simply made it possible to manipulate the hair-like wire in the contracted larynx. The same result might have been obtained if, for instance, two écraseur tubes had been substituted for the blades of the forceps.

This is the first case on record in which a subglottic tumor has been removed without anæsthesia, and without opening the larynx or trachea. I have looked over the records trying to find a similar case; but, after close research, have not been able to find a single one. In von Bruns's case, which he considered sufficiently rare to devote to it some thirty pages of his book, a papilloma was removed from below the vocal cords with the forceps; but tracheotomy had been performed previous to the operation, and the patient was under the influence of an anæsthetic, so that the operator could proceed deliberately and take as much time as he liked.

Paper.

CASES OF LARYNGEAL ŒDEMA.

By THOMAS AMORY DE BLOIS, M. D.

THE fact that during the past winter several instances of death from asphyxia due to laryngeal œdema have been published in the medical press is my only excuse for bringing before you these few cases of an affection upon which so much has already been written.

I think the subject has been divided by all writers into, first, a class of cases which apparently originate in the larynx, and are not coincident with other disease; second, those cases of œdema which appear to be propagated from some inflammatory process going on in other parts of the mucous tract; and, third, those which form sequelæ, or occur in the course of some other affection, such as syphilis, tuberculosis, the exanthemata, etc.

The first variety, or "acute laryngeal œdema," called also acute laryngitis, is undoubtedly of very rare occurrence, for in almost

every case there will be found some pharyngeal inflammation. But while I report some cases which occurred in patients at the time suffering from syphilis or phthisis, yet I purposely omit several cases I have had of chronic œdema occurring during those diseases. My cases were all acute so far as their course went, and, if I had not known that the patients had syphilis or tubercle, I should have considered the œdema as belonging to the first variety, so little did they differ from this type.

As œdema of the larynx occurs sometimes, but not often, in the course of syphilis and tuberculosis, it certainly can not rightly be considered as forming part of the course of these diseases, and should rather be classed as an accidental complication of them.

The pathology of laryngeal œdema is certainly far from being well understood, for, should it be possible in most cases to obtain autopsies, minute examination would be next to impossible, for the specimen would have parted with its water to a large extent before a section could be made; and hardening in alcohol would offer no advantage, for, on account of the different densities, the same loss would take place from endosmosis.

Taking the pathology in general, then, there is a transudation from the blood-vessels into the network of the submucous tissues, which so tightly hold the imprisoned serum that, as Bayle has expressed it, it can not be squeezed out. This does not, however, prevent the œdema from gradually emptying through the small punctures made in scarifying.

To what, then, is this transudation due? Perhaps, as Charazac says, to inflammation; perhaps to arrested return circulation; or may it not be a vaso-motor change not dependent upon either? It does not seem probable that either inflammation or obstruction could produce œdema with the startling rapidity which is sometimes seen.

In one of my cases I made an examination and did not observe the œdema, but only the very severe laryngitis. But, after detaining the patient to await the arrival of the admitting physician of the hospital (perhaps for half an hour), and on making a second examination, the commencing œdema was so marked as to call for local treatment.

Case I.—On July 17, 1880, I saw my first case of œdema at the Boston Dispensary, in a man of thirty-five without previous history of constitutional disease. The effusion affected one aryepiglottic fold, was very recent, and yielded promptly to local applications of astringents, and blisters to the neck.

Case II was seen on August 26, 1880, in a man of fifty-two, who had slight œdema of both aryepiglottic folds. I believe the case was tuberculous, but the treatment was about as in the first dispensary case.

Case III.—February 4, 1881, at the Boston Dispensary, a man of twenty-four, with œdema of the epiglottis. Folds greatly inflamed, but not œdematous. I treated this case with topical applications of solution of nitrate of silver. Recovery followed in a few days.

Case IV.—April 21, 1881, at the Boston Dispensary, a woman of thirty-nine. The case complicated a small retro-pharyngeal abscess, to which it probably owed its origin, and after evacuation the œdema subsided.

Case V.—June 30, 1882. In a dispensary case there was œdema complicating laryngeal phthisis. The œdema was never great enough to threaten life, and subsided during the local treatment of the larynx.

Case VI.—September 21, 1882, at dispensary, woman aged forty. Acute œdema involving one aryepiglottic fold. No history of previous disease. Scarified with concealed lancet. Recovery in twenty-four hours.

Case VII.—November 20, 1882, at the Boston Dispensary, a man aged thirty-five. Acute œdema of epiglottis and aryepiglottic folds, not threatening life. History of exposure to cold. Subsided in two days after free scarification.

Case VIII.—September 27, 1883, at Boston City Hospital, woman of twenty-three, having had laryngeal tuberculosis for five months, developed œdema of the aryepiglottic folds, which subsided under general and local treatment without scarification.

Case IX.—At the dispensary, November 13, 1883, a man aged thirty-six—in fact, the same patient as in Case VII—who had this second attack at exactly the same time (to within a week) as the year before. The œdema, however, was greater, but again subsided in about a day by prompt scarification. This case corresponds to one reported by Dr. Cambette, in which the affection returned every winter for several successive winters.

Case X.—In private practice, October 2, 1883, Miss E. W., aged about twenty, came to my office at 7 A. M., having on the previous 28th of September consulted me for pharyngitis. She gave a history of having on the night of the 1st remained out in the air at a seaside resort up to a late hour. She complained of sharp pains, like the pricking of pins, in the throat; the voice was very hoarse; there was a good deal of dyspnœa; she was restless and anxious. Unfortunately, my concealed lancet was at the instrument-maker's, and I had nothing else that I could use; so, leaving the patient in the office inhaling the vapor of boiling water, I drove to the instrument-maker's and returned with a lancet, with which I freely scarified the epiglottis and folds, which were greatly œdematous, white, and glistening; the hæmorrhage was profuse, and I drove with the patient to her home and scarified again that evening, although the

patient had been somewhat relieved by the previous operation. The following morning there was no evidence whatever of the œdema.

Case XI.—At the City Hospital, July 10, 1884, a man, aged thirty-two, had had acute laryngitis for three days, at the end of which time he appeared at the hospital with œdema involving the epiglottis and aryepiglottic folds; there was some dyspnœa. The œdema subsided in forty-eight hours after the use of the lancet.

Case XII.—Mr. N. M., a patient of Dr. Fifield's, of Dorchester, whom I saw with him in consultation, October 12, 1885, and who gave me the following history: The gentleman had recovered from diphtheria, and had subsequently developed an acute follicular amygdalitis, and during the past few hours had had considerable dyspnœa. The doctor had made several visits to the house during the preceding day. On examination, I found a strong, robust man of about thirty-five, who was greatly prostrated and who breathed with effort; he was weak and nervous and in a profuse perspiration. He had double follicular amygdalitis, with some œdema of the uvula, and it was necessary to scarify the tonsils, etc., before the jaws could be separated sufficiently to obtain a view of the larynx, which, when seen, showed œdema of the epiglottis and folds, and this extended well down into the larynx. After many unsuccessful attempts, I at last succeeded in introducing the concealed lancet into the throat and thoroughly scarified the œdematous parts. There was considerable hæmorrhage, but the patient expressed great relief, and the dyspnœa was certainly lessened. Blisters were applied to the throat, and I agreed to see the patient in consultation the next morning. Dr. Fifield could not believe that he would not be called during the night, and so made every preparation to perform tracheotomy at short notice; but when we saw the patient in the morning there was not a vestige to be found of the œdema, and the amygdalitis was much better. In a few days the patient was out at his business.

Case XIII was a case in private practice. T. E., a man, aged thirty, had had syphilis, but when he consulted me he had no evidence of the disease. He consulted me on the afternoon of the 5th of January, 1886, and at that time had some pharyngitis and an acute laryngitis following exposure to cold. I made applications of astringents to the larynx and prescribed for him, which directions, however, were not fully carried out. The next morning he again consulted me, and was at the time suffering great pain in the throat at every inspiration—as he expressed it, "sharp, darting pains." On examination, there was marked œdema of the epiglottis and one aryepiglottic fold. I scarified the œdematous parts, the patient being very much terrified, and he fainted immediately afterward. I sent him to the City Hospital, where he was put into a room with steam, and arrangements were made to do tracheotomy as soon as required. I saw the patient the next day, the œdema having by that time involved the other fold, so that the image was that of the typical three bladders, pinkish-white and glistening. There was considerable dyspnœa.

I again freely incised the parts. The hæmorrhage was so great as to be troublesome. The following day the larynx was very slightly œdematous. The patient remained in the hospital and was treated for laryngitis, but had no return of the œdema.

Case XIV.—P. C. was a male patient, aged twenty-six, whom I had treated the year before at the City Hospital for the throat complications of syphilis. At that time he had ulceration and loss of the uvula, with partial adhesion of the palate to the pharyngeal wall. The fact that it did not entirely adhere was, I think, due to the efforts of the patient himself, who daily passed an oiled probang behind the velum. On the 30th of January, 1886, this young man came under my care for syphilitic pharyngitis; but the ulcers, although deep, healed without difficulty. On the 13th of March he appeared with an acute laryngitis, and also œdema of the epiglottis and folds, and some dyspnœa; these parts were scarified and the patient was taken into the house, where, with the help of steam and large doses of iodide of potassium, he made a good recovery and was discharged on the 23d of March.

These fourteen are the only cases of laryngeal œdema that I have ever seen. They represent the exponents of this disease in four thousand throat cases which I have treated myself in both private and hospital practice; they cover a period of six years, and were carefully collected from the records of the two institutions mentioned and from my own case-book. Occurring, as they did, among different classes of people at different times of the year and in different institutions, it seems to me that these cases form a very fair standard of the frequency of the affection, at least in this part of the world—or, in other words, one in every three hundred throat cases.

The two hundred and forty-five, then, that Sestier reports would represent over seventy thousand throat patients at the same ratio. Œdema would appear to be more prevalent abroad than here.

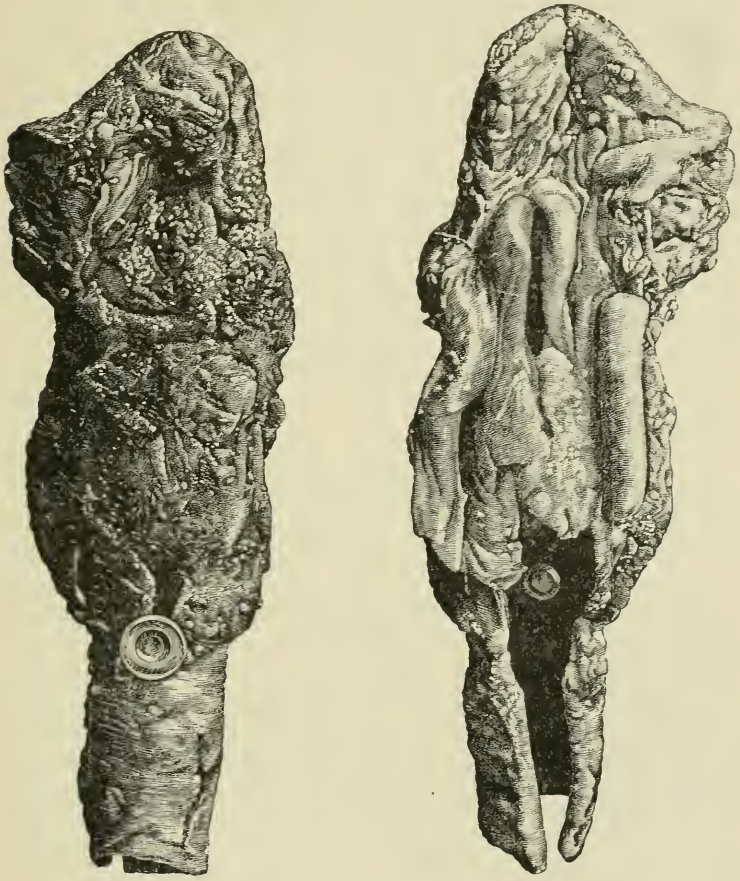
To my fourteen cases I should like to add two which have been reported—one in the "New York Medical Journal" and the other in the "Boston Medical and Surgical Journal"—during the past year.

The first of these occurred in the service of my former student, Dr. O. A. Gordon, at the time house surgeon at St. Mary's Hospital, Brooklyn, and I give the history in his own words:

"Dear Doctor: I am very sorry that I am not able to give you a better history of the case in question, but you are welcome to it, such as it is. I presented it at the Brooklyn Pathological Society, and was not aware that it was published. There was no microscopic examination, and the pathologist's notes are very brief. I find the following notes in my history book:

"Thomas T., aged fifty, single, born in Ireland, laborer, well nour-

ished, was admitted September 2, 1885. The patient presented himself for admission this afternoon about six o'clock; says he has had a sore throat for about one week, and has difficulty in swallowing. He is quite hoarse and unable to open his mouth more than an inch, making an examination of the larynx impossible. There is quite a marked enlargement in the right submaxillary region (not fluctuating). Pulse normal, and but slight rise in temperature. He was sent to the ward, and the enlargement painted with iodine and a mild gargle ordered. At about 8 P. M. (on the same day) the house surgeon was notified that the patient was



Anterior. Posterior.

choking. On arriving in the ward he was found to be gasping for breath and very cyanotic. About one minute was spent in trying to relieve him

by milder means, when laryngo-tracheotomy was performed and a tube inserted. The time from the attack to the completion of the operation was not more than four minutes, but he did not make any attempt at respiration after the tube was inserted. Artificial respiration was kept up for several minutes, but availed nothing.

"*Autopsy.*—Brain œdematous, markedly emphysematous lungs. The right side of the heart distended with venous blood. An abscess of about the size of a walnut in the right tonsillar region; marked œdema of all the submucous tissue above the vocal cords (including the epiglottis). The aryepiglottic folds and adjacent tissue were swollen, forming a tumor on either side which nearly closed the rima glottidis.

"You will see that the patient was only in the hospital about two hours, and that no diagnosis had been made, as it was about dark when he came in. He was able to walk to the hospital, and I thought it was nothing more than a submaxillary abscess forming, and that there was nothing urgent in the case. I was passing through the ward about half an hour before I was called, and he was up and conversing with other patients. I advised him to go to bed, and told him I would see him in the morning. The case is of interest as showing the danger a patient is in with œdema of the larynx, and the importance of an early diagnosis. I have no doubt that the patient's life would have been saved had tracheotomy or scarification been resorted to half an hour earlier, but you will understand from the history why a diagnosis was not made.

"I inclose some photographs which were taken the second day after the specimen was removed. The œdema at that time had fully one half subsided.

"Before the patient's death, when I entered the ward he was on his feet, with tongue protruding, and very black in the face. I tried to pass my finger into his mouth, but was unable to.

"Yours very truly,

"O. A. Gordon, M. D."

The second of these cases occurred in the practice of Dr. R. T. Edes, of Boston, who writes me as follows:

"Dear Doctor: You are very welcome to make any use of this case you please. I am sorry the notes are not more minute, but think that they tell the essential points, except those which might have been determined by the laryngoscope. . . . I think it possible that there may have been a spasmodic element in the case. He was an impatient and excitable man, and it seems to me that it is not improbable that when he felt a slight obstruction he undertook to overcome it by violent efforts, and thus rendered it worse. I am yours very truly,

"R. T. Edes.

"G. R., a robust and muscular man, with, however, rather a pale complexion, aged thirty-five. On Tuesday, December 29th, was exposed

to cold wind, upon which he remarked. Wednesday, a chill in the morning, but went to business, from which he returned soon with a sore throat. He was seen by me about 4 P. M. He could not speak aloud, and had great difficulty in swallowing.

"The fauces were uniformly red, but not much swollen, and the tonsils not enlarged. No external swelling. He said he had been a little nauseated. Prescribed ice to swallow, citrate of magnesium, Tully's powder, etc. Thursday he had not slept; he wrote instead of speaking, and said he could not swallow, and made some vain attempts in my presence. The throat looked about as the day before; he said otherwise he was all right; was hungry, and would be glad to eat if he could. Temperature 101°, pulse 120. At this time there was no complaint of dyspnœa, and no appearance of it. No cyanosis, no exaggerated muscular efforts or constrained position. About 11 A. M. he wrote a note. About 12, after swallowing a very little ice-cream, jumped out of bed, said or wrote that he was choking, and made 'a horrible noise' (evidently that of forced and obstructed respiration). A considerable amount of mucus was withdrawn from the fauces, and he died in a few minutes. At the time of my visit there was possibly noticeable a very slight stridor, but barely perceptible."

"110 Boylston Street, *May 23, 1886.*

"Dear Dr. De Blois: I inclose a report of the points of interest in the case of Mr. R. (Dr. Edes's case), and also say a few words in regard to what, in my opinion, is the form of œdema in this case.

"Sincerely,

"W. W. Gannett."

"*December 31, 1885, 7 P. M.* G. R., vol. iv, p. 206.

"The autopsy was made seven hours after death. The body that of a large, well-developed, and well-nourished man. Rigor mortis present. Bluish tint to lips. The blood in general was fluid. The glottis was of especial interest, the epiglottis being markedly thickened. The aryepiglottic folds, vocal cords, and tissues of the larynx were markedly increased in thickness, and of a boggy feel. On section of these parts, the connective tissue was found to be thickened, and to present a gelatinous appearance and a moist surface, yielding a thin, clear fluid on pressure. The mucosa of the glottis, trachea, and larger bronchi had been so modified by the preservative used, about a tablespoonful having been poured into the mouth by the undertaker before he could be stopped, that no conclusions could be drawn as to the condition of the mucosa at the time of death.

"The spleen and kidneys were dark in color from venous engorgement; other organs not remarkable. Death evidently resulted from suffocation, as shown by the fluid condition of the blood and the venous engorgement of spleen and kidneys. As to the form of the œdema in this case, it is evidently of the inflammatory variety, hydræmic and ob-

structive causes being readily thrown out, the individual having been in perfect health until within a day or two of death. Moreover, the autopsy showed no general or local cause for obstructive œdema. There was probably a catarrhal inflammation of the larynx, and the œdema was secondary to this. As stated above, the use of a preserving fluid had made it impossible to state what the condition of the mucosa was."

The exhaustive monograph by Dr. Charazac, "Étude sur l'œdème du larynx," has so recently appeared that many references on the subject would be hardly desirable, but these few points might be noticed: Massei and Semon have each reported a case in which the œdema involved the vocal cords alone. I think in no other cases have they been known to be affected.

Charazac found twenty-one cases of primary acute laryngitis with œdema, the duration of which was from one to eight days. Of the twenty-one patients, eight died, and the cure of the others was effected with and without tracheotomy, so that, since the time of Sestier, who believed the disease fatal in the majority of cases, the prognosis has certainly improved.

Charazac advises against scarification in secondary cases, and in chronic cases advises counter-irritation.

Schiffers applied chromic acid (1 to 10) with good results in reducing the œdema.

The use of catheters in the larynx has been advised by Héring, McEwen, and Szeparowicz.

So far as my own experience in treatment goes, out of my fourteen patients six recovered under treatment by astringents, eight under scarification. Possibly, had this procedure not been carried out, one or two of the cases might have proved fatal. That scarifying secured the favorable results is not, of course, proved, but it seems as if it might be well to try it before performing tracheotomy, as it is possible that the necessity for it might not continue, and, if the œdema persisted, tracheotomy could always follow as a secondary operation.

Discussion.

Dr. S. Johnston: What was the internal treatment in these cases?

Dr. De Blois: Generally with astringents of different kinds; iron, tannic acid, and similar remedies. Where the syphilitic diathesis was present, iodide of potassium was given in large doses; but in all I used local treatment as in cases of simple œdema, for the symptoms were just as threatening, owing to the local obstruction, as in cases not syphilitic.

Dr. Donaldson: In such cases of acute œdema O'Dwyer's method of intubation is worth trying, and I would suggest it.

Dr. Delavan: I think that the suggestion has been already carried out by Dr. O'Dwyer. The pressure of the tube reduces the œdema of the mucous membrane, just as it sometimes does after tracheotomy. In such cases as these the introduction of the laryngeal tube is probably safer than tracheotomy.

Dr. Jarvis: In a case which came under my notice some years ago I gave the fluid extract of jaborandi, tentatively, with a view of producing diaphoresis, and thus causing absorption of the laryngeal effusion. The man returned the next day, entirely relieved, but whether it was due to the remedy or a coincidence I could not tell. Afterward I saw in a foreign journal that pilocarpine had been used successfully in laryngeal œdema. I therefore concluded that the patient was really benefited by the jaborandi. As regards the usefulness of scarification I have some doubt; I have never seen much good from scarification. A case bearing upon this I have already reported to the association, in which, after opening the larynx, I scarified the œdematous parts, but found that, unless the knife was passed in every direction through the mucous membrane, it did not relieve the swelling. There was no collapse of the walls like a bladder; but the serum was diffused through the cellular tissue.

Dr. Morgan: My experience with cases of œdema of the larynx, though limited, has been rather fortunate, the few instances which I have met with having been of a mild type and readily amenable to active therapeutic measures. My usual treatment embraces active mercurial purgation, the application of cantharidal plaster over the larynx, inhalations of conium, cannabis indica, or jaborandi, and pigments of silver nitrate, zinc chloride, etc., directly applied to the larynx. Scarification I have occasionally resorted to with good results, but have never found it necessary to perform tracheotomy for this trouble. I have recently seen a case of acute laryngeal œdema, occurring in a male patient, the subject of chronic nephritis, in which there was considerable ascites and anasarca. The aryepiglottic folds, on laryngoscopic examination, were found enormously infiltrated, and well-nigh complete laryngeal stenosis existed. The respiration, which had been unimpeded a few hours before, was distressing to behold, and death from dyspnœa and asphyxia was imminent. The propriety of tracheotomy was considered, but I dissented therefrom, remembering the experience of my preceptor, Fauvel, in similar cases, which he has denominated "aphonie albuminurique."

Fauvel states that œdema of the bronchial tissues always precedes the invasion of the larynx in general dropsy, and hence a tracheotomy would be futile. My patient died from œdema of the lungs and larynx, the immediate result of a cold bath. In my opinion, tracheotomy in such a case would only hasten death, or perhaps prolong for a short period the misery of a hopeless case. So far as I am aware, the occurrence of laryngeal œdema in the course of the diseases commonly accompanied by general dropsy has been little studied.

Paper.

A CASE OF PERICHONDRITIS OF THE LARYNX; NECROSIS OF THE CRICOID.

By C. H. KNIGHT, M. D.

DESTRUCTION of the cartilages of the larynx, resulting from inflammation of their perichondrium, is by no means uncommon. Numerous instances have been recorded of its occurrence as a sequel of typhoid fever, as a complication of tubercular laryngitis, associated with malignant disease of the larynx, and in the course of syphilis. The opportunity of studying the condition in a pathological specimen may perhaps lend additional interest to the following history:

W. S. M., aged seventy-three, single, cabinet-maker, came to the Northern Dispensary in February, 1886, suffering from dyspnœa and dysphonia, which he said began about three months previous and had been gradually increasing. The obstruction was obviously laryngeal and affected equally expiration and inspiration. The voice was remarkably low-pitched and raucous. There was occasional hoarse cough, with expectoration of thin purulent sputa, which showed streaks of blood after an unusually violent paroxysm of cough. The breath was extremely fœtid. There was no pain referable to the larynx, except during phonation or deglutition and after coughing, but the patient complained of sensitiveness under external pressure, and when the larynx was moved from side to side. There was no apparent thickening, swelling, or œdema over the region of the larynx. The cervical glands were not enlarged. Examination with the laryngoscope showed a diffuse, symmetrical œdematous swelling of the posterior wall of the larynx, the natural contour of the arytenoids being entirely effaced. Only a small portion of the anterior extremities of the vocal cords was visible. They seemed to be normal. The epiglottis was congested and somewhat swollen. Oozing into the cavity of the larynx from its posterior wall appeared a small quantity of thin, white secretion. It was impossible to keep the laryngeal mirror in position more than a few seconds on account of the necessity of clearing the larynx. No ulceration could be seen, and the source of the secretion could not be precisely determined. Owing to the patient's condition, no attempt was made to probe the larynx or to carry on a more extended examination.

The general condition of the patient was extremely bad. He was very weak and much emaciated, having been able to take little or no solid food

for three or four weeks. He had received no treatment whatever, except a series of cough mixtures, which, of course, gave him no relief. Stimulants and soft food were ordered, and the patient was directed to use every two hours a steam inhalation of compound tincture of benzoin. He was not seen again for four days, when he reported in a very much improved condition. Still the tumefaction over the arytenoids prevented a complete view of the cords. The amount of secretion in the larynx seemed to be less; its character was unchanged. Breathing was much easier, but the dysphagia was only little, if at all, diminished. Again the patient disappeared and was not seen for a week, when he returned in a very much worse condition than when he first applied for relief. His breathing was excessively labored and he was in a state of extreme exhaustion. He was at once ordered to the hospital, where it was my intention to perform tracheotomy, if necessary. Instead of following my instructions, he went to his home. The following morning he rose from his bed to light his fire, fell on the floor, and died, before a friend, who occupied the room with him, could reach him. According to the best information obtainable, death seems to have occurred quietly, without struggle or sign of suffocation, apparently from asthenia.

The autopsy was made, with the assistance of Dr. Henriques, fourteen hours after death. The larynx, pharynx, and œsophagus were first removed intact. On section of the trachea, a small quantity of bloody pus was found on the mucous surface as far down as the bifurcation. The lungs showed numerous emphysematous areas and old pleuritic adhesions, but otherwise were normal. No trace of tubercular deposit was found and no syphilitic lesion could be discovered. The heart appeared to be normal; the pericardial sac contained about two drachms of perfectly clear serum. The specimen itself, which has been most carefully examined by Dr. Ferguson, of New York, consists of the pharynx, larynx, and upper portions of the œsophagus and trachea. On the anterior wall of the laryngo-pharynx is an ulcer exposing the entire thickness of the partially ossified cricoid cartilage. It does not communicate with the larynx or trachea. Its edges are undermined to the extent of half an inch along the posterior surface of the cartilage. An ulcer involving the mucosa and the muscular tissue occupies the posterior wall of the pharynx at the level of the cricoid. The edges of both ulcers are elevated and very much thickened. There are superficial erosions of the vocal cords. There are numerous miliary masses on the mucous surface of the trachea composed of round and oval cells, granular detritus, bacteria, and micrococci. Numerous sections through the tissues surrounding the pharyngeal ulcers fail to discover tubercle bacilli or evidence of tumor development. Collections of small round cells are found, limiting small areas of degeneration, which give the appearance of tubercles. There are no giant cells. The fibrous tissue between the muscular bundles in the wall of the pharynx near the ulcers is increased and contains many groups of small round and spindle-form cells. Sections through the mucous membrane

of the trachea show similar cells, and the stroma of the mucous glands is infiltrated with similar small round elements.

So much has been written on the subject of laryngeal perichondritis that it is not worth while to detain you with an extended review. The exhaustive article by von Ziemssen in his "Cyclopædia" (vol. ii, 814), where numerous valuable references may be found, and contributions by Türck, Mackenzie, Schroetter, Retslag, and others thoroughly cover the ground. Perhaps the most important questions relate to diagnosis, and, secondarily, to prognosis. In many cases the laryngeal condition may escape the notice it deserves, since the constitutional disease provoking it or associated with it demands the larger share of attention. The prognosis must be considered grave, if not necessarily fatal, especially when the cricoid cartilage is involved. A case has been reported by Ruehle in which this cartilage became necrotic and was discharged entire. Cohen narrates an interesting case of chondritis of the cricoid in which he did tracheotomy, and opened several intra-laryngeal abscesses. There was apparent reproduction of the cartilage, "the original one remaining necrosed in the cricoidal portion of the interior of the larynx as a foreign body" ("Diseases of the Throat and Nasal Passages," p. 526; also, "Trans. of the Path. Soc. of Phila.," 1874, p. 148). The degree of deformity and consequent impairment of function depend upon what and how many cartilages may be involved. The difficulty of determining this point is often insurmountable. A thorough examination may be impracticable, owing to intolerance of the parts, or to the general condition of the patient; or, in case a laryngeal exploration is possible, the region may be so obscured and distorted by inflammatory thickening, ulceration, or œdema, that the usual landmarks can not be identified.

The question of ætiology is of scarcely less interest and importance. Necrosis of laryngeal cartilages following typhoid fever has been especially observed by Trousseau, Rokitansky, and Sestier. Liebermeister maintains that in these cases the affection of the cartilage is not primary, but is due to extension of ulceration from the mucous membrane. On the other hand, Sestier asserts that it may occur without ulceration, and the latter view is corroborated by Greenfield. Tuberculosis, carcinoma, and syphilis have also been mentioned as prominent causes of laryngeal perichondritis. To these must be added variola and traumatism. Under the latter head should be included not only external violence, but also the injudicious use of œsophageal bougies, especially in the aged. In this

connection I may refer briefly to a case not yet reported which occurred in the service of Dr. Asch, at the Manhattan Eye and Ear Hospital:

A woman, about forty years old, swallowed a plate of false teeth during an epileptic fit. The plate was dislodged from the pharynx with great difficulty. A few weeks later the woman came to the hospital with an abscess on the posterior wall of the larynx, which Dr. Asch opened. Subsequently the house surgeon did tracheotomy during an attack of acute œdema or spasm of the larynx. The patient recovered, with great deformity of the larynx and complete loss of voice.

Unfortunately, we have not had the opportunity to examine her recently, so that I am unable to describe her present condition. There is no doubt in my own mind that this was a case of traumatic perichondritis. Forcible and prolonged use of the voice, as in certain occupations, has been suggested as a cause by Flormann. Primary laryngeal chondritis, resulting from early ossification of the cartilage, may involve the perichondrium (Albers), and, finally, pressure of an ossified cricoid cartilage against the vertebral column may develop a traumatic perichondritis (Dittrich). In some cases it may be very difficult to discover the origin of the lesion, as in one reported by Hall ("Trans. of the Clin. Soc. of London," 1882, xv, 195; 1884, xvii, 151). His patient died after the lapse of two years or more, and at the autopsy various lesions characteristic of syphilis were found. The conclusion was therefore adopted that syphilis had caused the necrotic changes in the larynx, which in the first instance had been attributed to a laryngitis accompanying an extensive bronchitis, no history and no signs of constitutional disease having been at that time discovered. In searching for the cause of the condition in the case which I have reported, it was learned that about one year ago the patient was violently seized by the throat in the course of an altercation and was nearly strangled. The immediate consequences of this incident were laryngeal pain and partial loss of voice, lasting nearly a week. No other trouble followed, except slight cough, which was supposed to be bronchial, until three months before the case came under my observation, when dyspnœa supervened, attended by marked change in the quality of the voice, and great pain and difficulty in swallowing. The patient had never had a serious illness since childhood, and positively denied syphilitic infection. He had never used liquor to excess; but it was found that his circumstances in life were such as to deprive him of proper nourishment, often for a very long period. It is quite evident that

impairment of vitality due to this fact, combined with his extreme age and the condition of ossification of the cartilage, must have predisposed the patient to the development of the affection. It would seem, therefore, that traumatism may be regarded as the immediate cause of the laryngeal lesion. The unusual site and extent of the ulceration, and the absence of pulmonary tuberculosis and of tubercle bacilli in the sections examined microscopically, exclude the idea of tubercular laryngitis.

Paper.

A CASE OF GUMMATOUS DISEASE OF THE LARYNX, WITH SPONTANEOUS REOPENING OF THE LARYNX AFTER THYREOID LARYNGOTOMY.

By EDGAR HOLDEN, M. D., Ph. D.

THE circumstances attending the diagnosis in the following case, its history, and termination, have seemed to me to make it worthy of attention and record:

Mr. L. D., a small, dark-complexioned man of thirty-five, with an appearance of poverty belied by his possessions, came under my observation on May 20, 1885.

Dyspnœa, aphonia, dysphagia, and nausea, with debility, were the prominent symptoms. The mirror showed almost complete occlusion of the larynx, preventing a view of the true cords. There were cicatrices on the epiglottis and right laryngeal wall, but no active ulceration. Several spots, which at first appeared to be ulcers, proved, after cleansing, to be dull-yellowish prominences of rugæ, which formed the infiltrated right wall of the larynx. The left side presented a rounded mass of the same dull yellowish-pink appearance, looking like a coalescence of similar rugæ. These are shown in the drawing herewith submitted. He denied syphilis, admitted gonorrhœa in 1881, and stated that Dr. Elsberg had treated him for ulceration of the epiglottis, and that he pronounced the ulcer specific, and so treated.

In 1883 he was treated by Dr. Rice, a Fellow of this society, for extensive but superficial ulceration, and at that time presented all the appearances and symptoms, as Dr. Rice has since informed me, of tubercular disease, with apparent consolidation at the apex of one lung.

Under local and constitutional treatment the ulcers healed, and the dyspnœa, aphonia, and other subjective symptoms almost disappeared, the improvement being evident in the long intervals between his visits.

When last seen by Dr. Rice, several weeks before my examination, he was much worse, and I take the liberty of quoting from a report kindly

given me by him: "Right vocal band almost immovable in median line; only slight movement of the left, which (if I remember) was about midway between abduction and adduction. During phonation the ventricular folds came together, and the voice seemed to be produced by their approximation. I remarked that the bands were rough with serrated edges."

Upon my examination, May, 1885, this had changed to the condition shown in the drawing, and above described. The appearance of the man, and the fact that there were evidences of some disease at the apex of the right lung, naturally suggested tubercular disease; but the facts that the ulcers were healed, that neither the epiglottis nor the capitula Santorini were tumefied or otherwise suggestive of tubercle, and that the area of consolidation in the lung was not surrounded by progressive disease, led me, after repeated examination, to conclude that the disease was either lupus, syphiloma, or carcinomatous infiltration. Believing it to be syphilis, I put him upon the use of iodide of potassium, rapidly increased to seven grammes daily, with appropriate local treatment.

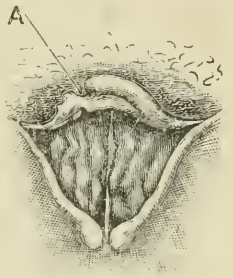


Fig. 1.

Suddenly, however, after ten days of marked improvement, he became intolerant of the remedy, and so rapidly did he retrograde that I doubted my diagnosis, and, influenced by his extreme dyspnœa, sleeplessness, and pain, as well as also by the belief of counsel, that the disease was malignant, I had him removed to the new St. Barnabas Hospital as a private patient, and, under chloroform, performed thyreoid laryngotomy on June 4, 1885.

There was no ossification of cartilage, and division was readily effected by strong, curved scissors, without previous tracheotomy. Hæmorrhage into the trachea was readily controlled, and was only reasonably profuse. The only feature of the operation that is worthy of record was that respiration stopped whenever traction was made on the alæ of the thyreoid, and only recommenced upon application of a strong galvanic current and hypodermic injection of brandy. This occurred three times during the operation.

There was no ulceration visible; the open larynx, as shown in Fig. 2, exhibited the true cords intact, but hyperæmic and apparently hypertrophied. The rugæ of the right wall, above alluded to, were of a yellowish-pink color, suggestive of fatty degeneration, not detachable nor movable on the cartilage, and but slightly vascular. The tumor of the left wall was of the same appearance. This was removed by a wire écraseur, with but slight bleeding.

The posterior wall of the larynx and the ventricular bands being involved in the same change and of the same yellowish-pink color, the tissues were cauterized with acid nitrate of mercury and washed with a

strong alkaline solution. In view of the swelling, sloughing, and inflammation likely to ensue, tracheotomy was performed above the thyreoid isthmus, a tube inserted, and the larynx closed with one deep suture through the cartilage, as only the cricoid was left to support the larynx, and the external wound closed with numerous silk sutures.

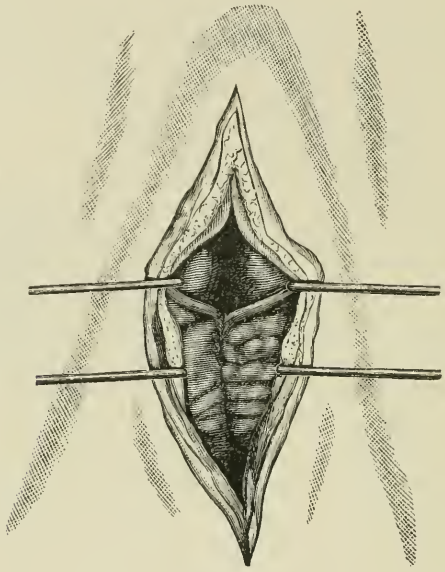


Fig. 2.

The progress toward recovery was remarkable; the sloughs separated early, the tube was removed on the tenth day, and breathing was perfectly free and phonation very fair; indeed, unusually so at this early date after operation.

The larynx soon became firm, the external wound healed, and, although the tracheal wound remained open, he was so far recovered as to insist on being allowed to go home.

Contrary to my wishes, he was taken by his friends to his house, situated in a most unsavory locality next to a market, where in the heat of an early summer his health immediately deteriorated, and on the fortieth day after operation the whole wound was torn open during a paroxysm of cough induced by lodgment of food in the glottis.

It is unnecessary to detail the efforts made to keep the parts in apposition. They were unsuccessful. His wife and friends would not allow of his removal to the hospital or to a more healthful quarter, and, with but forlorn hope, I put in five silver sutures, with narrow metallic bars on each side of the larynx, August 27th, eighty-four days after the operation.

Under the wretched surroundings, in a foul atmosphere, and with insufficient nursing, a laryngo-tracheal catarrh developed, and the sutures tore or sloughed out.

Examination of the lungs at this time and subsequently, as well by myself as by a friend especially expert in auscultation, showed no disease; the area of consolidation had disappeared, and the doubt as to tubercular disease, already untenable, was satisfactorily removed.

Strapping of the larynx and efforts to promote granulation were persisted in, and early in September, after removal to a quarter a trifle less unwholesome, there was marked improvement.

Examination by laryngoscope and by external inspection showed no return of the original disease, and breathing and phonation were satisfactory when the external wound was closed by compress; but the hyperæmia of the larynx and a commencing necrosis of the divided cartilages, with debility, cough, irritable stomach, the evidences of want of care and proper sustenance, and the impure air of a locality in front of which ran a foul-smelling canal, reeking with the filth of a neighboring market and brewery, augured ill for the patient.

Although now desirous of removal, his friends would not permit it. Several members of the family were ill with intermittent fever, and he himself contracted it.

The catarrhal laryngo-tracheitis increased, and on November 18, 1885, six months and fourteen days after the operation, and after five months with an open larynx, he died of exhaustion.

No autopsy was permitted, and, indeed, aside from possessing the larynx as a morbid specimen and determining extension to neighboring tissues, this was not a serious misfortune, as both intra- and extra-laryngeal inspection were made easy by a muscular atrophy of a remarkable extent, and an absorption of cellular tissue so complete as to expose the outlines of the hyoid and anterior thyreoid and even the scaleni muscles.

There existed some degree of perichondritis, and toward the end, as stated, necrosis of the cut ends of the cartilage.

In reviewing the case I am inclined to believe the morbid growth following the recurrent superficial ulcerations to have been of recent and somewhat rapid development, and secondary to a similar manifestation in the lung.

The latter, if gummatous, might, as is usually the case, have been converted into tough, contracting fibrous tissue, or have disappeared by "simple atrophy, with scanty, fatty metamorphosis."

The microscopical appearance of the part ablated showed the cells and connective tissue usual in syphiloma of mucous membranes, the former resembling uni-nucleate, colorless blood-corpuscles, from

0·02 to 0·04 mm. in diameter, mostly round, with comparatively large nuclei; the abundance of connective tissue, as stated by Wagner, suggestive of formation of callous masses due to fatty atrophy and resorption of cellular elements of the older syphilomata.

The question of diagnosis between lupus, tubercle, and syphilis of the larynx was well presented by Dr. Asch and Dr. Knight, and discussed before this society in 1881, but gummata were not alluded to. A full record may be found in the transactions for that year.

I have made no exhaustive inquiry into their bibliography, but my own experience and the works I have consulted lead me to believe that gummatous infiltration of the laryngeal walls is of rare occurrence. Mackenzie states that gummata are usually found on the posterior wall ("Pharynx, Larynx, and Trachea," p. 261), and his plates represent rounded conglomerate masses of small size, although he quotes one from Norton as of large enough size in the aryepiglottic fold to destroy life by suffocation.

As the matter of differential diagnosis is important, I would summarize my reasons for believing this case syphilomatous as follows, viz.:

There was a history of recurring ulceration that yielded to treatment (tertiary syphilis of the larynx having been styled "relapsing ulcerative laryngitis").

The cicatrix of the epiglottis was the result of ulceration, pronounced and treated as syphilis by Dr. Elsberg.

There was suspicious thickening of the sternal ends of the clavicles and of the periosteum of the tibia, with chronic induration of the post-cervical glands.

There was a condition of the apex of one lung simulating consolidation, which disappeared, as far as auscultation and percussion could determine, by atrophy or absorption; and, further, as there was no enlargement of neighboring glands, and the growth was rapid, yet did not recur after operation, and there were no manifestations on uvula or tonsils, malignancy, either of lupus or carcinoma, may reasonably be excluded. In thus speaking I am well aware of the histological similarity between the former and the gummata, and of the difference of opinion as to lupus of the larynx as an isolated affection.

The microscopical appearances were not conclusive, and, as may be inferred, I did not examine the morbid tissue for bacilli, as suggested by Haussmann, of Kiel, in a recent number of Virchow's

"Archiv," where disease of the buccal mucous membrane was in question.

In concluding, I would remark that, had I anticipated removal of the patient from the hospital to an unhealthy locality, I should have performed tracheotomy only, and trusted to the destruction of the morbid growths *per vias naturales*, without thyreoid section.

Paper.

GUMMATOUS INFILTRATION OF THE TONGUE.

By URBAN G. HITCHCOCK, M. D.

A DISEASE having its precise seat in the areolar tissue, and presumably likely to occur wherever such tissue is found, gummy infiltration is particularly prone to attack certain organs, as the brain, the nerves, the muscular tissue, the tongue, "which is as hard, to use a common expression, as if stuffed with peach-stones"; * and, according to other authority,† peculiar liability to the deposit under consideration is shown by the skin, iris, pharynx, soft palate, and tongue, the vascularity and constant activity of the latter being held accountable in this regard.

Of all these regions, the nerves and the tongue have, in the writer's experience, been those the most rarely affected. However, four cases of this disease in the tongue having recently come under observation, they were considered of sufficient importance to form the subject of a report, illustrating, as they do very aptly, the variation in symptoms dependent upon the particular part of the tongue occupied by the growth, and showing, moreover, the marked amenability to treatment which characterizes this affection.

The well-recognized tendency of this form of infiltration to undergo still further degeneration, and by its breaking down to escape finally by the process of ulceration, thus forming deep ulcers and cavities, indicates forcibly the necessity of its early discovery, in order that it may be promptly checked and the patient be spared the permanent deformity and discomfort resulting from subsequent contraction of the deep and irregular cicatrices and fissures. That these tumors may easily escape detection, especially when situated n t ıe more anterior parts of the tongue, seems probable from the fact of their causing exceedingly slight inconvenience when located

* Cullerier and Bumstead. † W. Fairlie Clarke.

in these regions; and the relative frequency with which deep fissures are here observed would seem to corroborate this view, for such fissures, as distinguished from simple wrinkles of the tongue, are conceded to be exclusively the result of gummatous deposit, and, like it, pathognomonic of profound constitutional infection.

In the first case, to be presently narrated, there existed on the right side of the anterior third of the tongue a very considerable gummy deposit, of which the patient was wholly unaware.

This was in the person of a man, L. M., forty-five years of age, who had contracted his disease twenty-four years ago, and, when first seen by me, had also a shallow tertiary ulceration on the posterior wall of the pharynx. Both of the lesions yielded readily upon the conjoined use of iodide of potassium and biniodide of mercury.

As exemplifying the occasional difficulty of distinguishing by the mere appearance of the lesion whether it is gummatous or cancerous, and as exhibiting by far the most extensive involvement of tissue, there is here adduced the case of a man, C. J. M., aged thirty-nine years, from whom no specific history could be obtained other than that of the development of the particular affection for which he sought relief. Its general characteristics, however, and especially its behavior under treatment, afford preponderating evidence that its character is the same as that of the other cases here reported, in all of which the history was confirmatory of their apparent nature.

In the present instance the patient had, in the latter part of December, 1885, commenced to be greatly distressed by a painful and tender swelling at the base of the tongue, which necessarily interfered greatly with deglutition, but did not affect him so severely as to prevent his attending to his duties, which were those of a workman on iron boilers. According to his recollection, the symptoms had lasted "about a week," when, at a moment of particular effort in striking a rivet, he felt something give way in his throat, which immediately became filled with matter. The bursting appeared to him to have been on the left side, and was not followed by entire relief, for, at the time he was first seen, dysphagia had been continuous and had prevented his taking sufficient food to maintain his full degree of nutrition. Especially in the last few weeks had he lost flesh. Upon examination by simple inspection of the mouth, and before a history had been obtained, a rather ominous appearance was presented. A very decided and angry swelling was discovered at the farthest visible portion of the tongue, mostly on the right side, and suggestive of malignant trouble beyond. Further examination, by aid of the faucial mirror, did not serve to improve the already grave aspect of

the case; for in that region of the tongue thus exposed were revealed on the right side a jagged fissure surrounded by irregular and exuberant tumefaction, and at the corresponding point on the other side an equally profuse mass of flabby, apparently adenoid formation, in which no distinct fissure was evident. Examination with a probe determined the existence of an extensive cavity in the depths of each of these locations, from which, it was immediately surmised, gummatous material had escaped at an early period. During the month which has elapsed since this case was first seen satisfactory improvement at first was promptly experienced and has been uninterruptedly continued under the use of the iodides of mercury and potassium. The cavities and granulations still persist, but in such reduced degree that they give the patient no indication of their presence.

In the opinion of Hutchinson, cancer may come from syphilitic ulceration of the tongue; and Fairlie Clarke specifies the ways in which cancer may so arise, namely, (1) by the syphilitic ulcer becoming gradually malignant, cancer arising, as it were, from the dregs of the disease, and (2) the scar left after the healing of the syphilitic sore seeming to form the starting-point of epithelioma. Clarke, furthermore, mentions, as being of diagnostic importance, the failure of cancer to improve under treatment.

In the two cases which follow, and which complete my present list, the patients were kindly referred to me by Dr. Delavan and Dr. C. H. Knight:

Case III.—Mrs. B., aged twenty-eight, married. The notes record distinctly the communication of the disease from her husband seven years ago, and the subsequent invasion of secondary symptoms. She now has a tertiary eruption on the left mamma and on the thighs. For the last year she has felt that her throat was not quite right, but she was not seriously disturbed until about two months ago, when there appeared on the right side, at the posterior part of the middle third of the tongue, what is now evidently a gummy tumor of the size of a small filbert, which has caused constant annoyance, especially in swallowing. Amelioration of the symptoms has taken place during the last two weeks under the same treatment as that already mentioned.

Case IV.—R. T., aged twenty-five, contracted the disease three years ago, and its development has been mainly in the mouth (mucous patches), although there have also been rheumatism and falling of the hair. At present the only manifestation is what appears to be a gummy tumor of the left side of the tongue in its posterior third. This is of about the size of a large pea, is very sensitive to pressure, and causes marked dysphagia. The symptoms were first noticed four days ago, and have steadily increased in severity.

In reviewing these cases, it is to be remarked that in no one of them was the fibrous septum of the tongue the exclusive seat of the deposit, which has been declared to select this tissue for its development, and that in three of the cases the deposit did not at all approach this structure. In no instance was there neighboring glandular enlargement. As might, perhaps, be anticipated, the degree of dysphagia produced by the growths was in direct proportion to the proximity of the deposit to the base of the tongue. Whether this is generally true does not appear from any works consulted. As far as these cases go, they bear out the assumption which has been made to the effect that the soft palate and tongue are never simultaneously involved in ulceration.

Third Day, Morning Session.

Paper.

A CASE OF HYSTERICAL SNEEZING APPARENTLY CURED BY INTRA-NASAL APPLICATIONS OF THE CONTINUOUS BATTERY CURRENT.

By SOLOMON SOLIS-COHEN, M. D.

MISS ——, aged twenty-eight, applied in the latter part of August, 1885, to my friend, Dr. Howard F. Hansell, of Philadelphia, with a ready-made diagnosis of hay fever, and with a ready-made therapeutic course which she desired him to carry out—namely, electric cauterization of the nasal mucous membrane. Dr. Hansell, without investigation of the case, referred the patient to me.

A few questions sufficed to dispose of the fancied hay fever. The attacks of persistent and uncontrollable sneezing, accompanied with lacrymation and dyspnœa, of which the patient complained, occurred at any and all periods of the year, depending upon nothing external to herself of which I could elicit an indication. Her knowledge of hay fever was derived partly from advertisements of quack remedies, partly from the daily papers. A glowing account in one of the latter, from the inspired pen of an imaginative reporter, of the supposititious cure of a prominent hay-fever sufferer by means of the electric cautery, had prompted her visit to Dr. Hansell, and her request "to be burned."

Inquiry into the previous medical history of this patient threw light upon the nature of her present trouble. She had, for ten years or more, been under almost uninterrmitted medical care. She had been in two hospitals; for "irritable spine" in the one, for "nervous tumor of the breast" in the other, to quote her own account. She had been subjected

to cauterizations along the spinal column, to a long course of electrical treatment, and to excision of a nodule from a mammary gland. The symptoms narrated as having necessitated the various therapeutic measures were of the most varied character, but largely consisting of pains. Pains in the breast that had been operated upon, and in the shoulder of the same (right) side, were still complained of, and the nasal symptoms were said to become more intense when these pains were aggravated. Upon inquiry of one of the hospital physicians under whose care Miss —— had been treated electrically, it was learned that the patient had always been regarded as a neuro-mimetic subject, though the exact nature of her symptoms was not remembered. Organic disease had been positively excluded.

The duration of the present symptoms, according to the statements of the patient, was about twelve months, the intensity having increased gradually. The paroxysms occurred at irregular intervals and lasted for ten or fifteen minutes as a rule, sometimes for more than half an hour; sometimes recurring frequently during a single day, sometimes occurring but once daily; sometimes being manifested but on one or two days in a week, sometimes on a number of days successively. The first manifestation would be a sensation of tickling in the nose, provoking a violent fit of sneezing; the eyes would burn, then water; a limpid fluid would be discharged from the nose, which organ would then gradually become occluded, so that breathing would have to be carried on through the mouth. Sometimes an asthmatoid paroxysm followed. Sometimes exhaustion brought the paroxysm to a close, sometimes it suddenly ceased without apparent cause. Sometimes somnolence followed. Mental or emotional excitement would sometimes provoke a paroxysm. Sometimes the attack appeared to be brought on by inhalation of dust, sometimes by cooking, sometimes by going into the open air; and often it came without apparent excitant. The statements of the patient were corroborated by her mother. I was very anxious to observe an attack, and I tried on several occasions to provoke one in my office, but without success. The patient was requested to come to the office in the midst of a paroxysm, but—although she twice started from home for the purpose, and, according to her own statement, sneezed all the way—the attack "very provokingly" ceased upon my doorstep. In fact, so potent did my presence or its apprehension seem to be that, on several occasions, the nose of my patient, which had remained occluded during half-an-hour's stay in the waiting-room, "opened" immediately upon her entrance into the consulting-room. For the fact of the paroxysms, then, as well as for their reported relief, the only evidence I have to offer is that of the patient and her mother. The larynx and pharynx were normal. Rhinoscopic examination, anteriorly and posteriorly, revealed normally contracted nasal chambers. The structures were all small, as was to be expected in the small-bodied, small-faced subject. Neither hypertrophy nor atrophy of the turbinated bodies, neither pallor nor injection of the mucous mem-

brane, could be discovered. The septum was unusually well formed, but a slight projection high up on the left side approached very nearly to the middle turbinated body, and it could easily be conceived that, when turgescent, the structures would be in actual contact. Just above this projection (the tuberculum nasi?) I succeeded in locating upon the septum a sensitive spot; that is, pressure with the probe upon the spot in question would cause the patient exquisite pain, and make her feel as if she were going to have an attack. I never succeeded, however, in actually producing a paroxysm.

Although the patient was told that she had not hay fever, and that cauterization was not indicated, she recurred to the subject frequently, and insisted that she "would never be well till she was burned."

Desiring to study the case, I at first instituted a palliative treatment with cocaine, directing instillation into both nasal passages of a few drops of a four-per cent. solution on the occurrence of the initial tickling. For two or three days this measure was successful. After that it failed, as did stronger solutions, both by instillation and by penciling, and the insertion of tablets of one eighth of a grain of cocaine hydrochlorate. Pencilings with a so-called oleate of cocaine (ten per cent.), and with a mixture of cocaine and cosmoline, retained a moderate degree of influence in allaying irritation and preserving the perviousness of the passages. Internal medication was then tried; bromides, valerianates, asafœtida, zinc, belladonna, and arsenic being given in various forms and combinations, separately and together. Belladonna, or rather atropine, seemed to have the greatest influence; but each and all apparently did good for a time and then failed. Bougies of belladonna and cocoa-butter of various strengths, from one-eighth grain to one-half grain of the extract, were inserted into the nostrils, both in conjunction with internal treatment and independently of it. These seemed to do a great deal of good, especially when inserted high enough to reach the sensitive spot in the left nose, and allowed to remain there until dissolved. At first used three times a day, then once daily, then on alternate days, then with gradually increasing intervals, these applications kept the paroxysms under control for two months, and the patient remained free from attacks for six weeks after cessation of treatment. She then returned (January, 1886), complaining of recurrence, and, although the formerly effective treatment was at once reinstituted, it utterly failed. A spray of ammonium bromide in glycerin and water, and local applications of a similar solution, were without effect. Daily applications of the continuous electric current were then instituted. The positive electrode was inserted into the nostril and placed upon the sensitive spot upon the septum. The negative electrode was placed upon any indifferent point upon the cheek. At first five Daniell's cells were used, the number being gradually increased to twenty. The length of the sittings—at first one minute—was gradually increased to five minutes. During the longer sittings the current was interrupted after one minute

by withdrawal of the electrode, and the application was renewed after an interval of half a minute. At first the patient complained of intense pain, and lacrymation was observed. As improvement was reported from day to day, the pain complained of diminished—that is, a stronger current was required to produce it—and lacrymation ceased. Finally, after two weeks' daily sittings, a current from twenty cells failed to produce special pain, and the patient professed herself well. However, she was made to return—at first twice a week, then once a week—for a month longer, during which time no recurrence had taken place. I have learned that no paroxysm had taken place four months after her discharge from treatment.

To what the recovery is due, and whether or not the paroxysms will return when the patient's mind becomes disabused of a peculiar error—for which I am not responsible—I do not know. A not inconsiderable experience with hysteria in its protean forms, especially in hospital practice, has made me distrust even the most plausible connection between recovery and the particular remedial agent employed at the time. I have sometimes seen as good results from the prescription of inert substances, when duly impressive cautions have been given not to exceed the dose, as from valerian, asafœtida, or other approved and vaunted remedies. The effect of mental impression upon these self-deluded patients is well known. Dr. Harlan has reported a case which I called to his observation in which apparent unilateral iridoplegia followed mycosis tonsillaris, in which great limitation of the field of vision and other ocular disturbances were noted, and in which I succeeded in relieving the apparent blindness and restoring mobility to the iris by the application of a wooden imitation of a Charcot magnet. When Miss —— was told that electricity would be applied, she took it for granted that the cautery was meant—the pain was to her the pain of heat—and her mother tells me that she has triumphantly asserted that she "knew she couldn't be cured without burning!" Rhinoscopic inspection after the applications showed that no eschar was produced by the current.

Paper.

A CONTRIBUTION TO THE PATHOLOGY AND TREATMENT OF THE RESPIRATORY VASO-MOTOR NEUROSES.

By JOHN NOLAND MACKENZIE, M. D.

WE are at present passing through a revolution of sentiment in regard to the pathology of certain affections whose external phenomena at least are chiefly or wholly manifested in the respiratory apparatus, and notably its upper segments. Phenomena inexplicable on commonly accepted beliefs have received their fitting explanation in morbid conditions of these structures linked to a disordered state —imperfectly defined it may be—of the vaso-motor sympathetic. Especially is this true of that interesting group of symptoms known as "hay-fever," but for which I think the term coryza vaso-motoria periodica a more appropriate appellation.

In this paper I shall limit myself strictly to the essentially vaso-motor neuroses, and shall not enter upon the discussion of the purely sensitive and motor reflex. As my views on the subject of the respiratory reflex neuroses, and especially in regard to vaso-motor coryza, differ in many essential particulars from those advanced by other observers, and as some of my *confrères*, who have done me the honor to quote from my writings, have apparently failed to appreciate the fundamental ideas underlying my theory of these affections, I will ask your indulgence while I recapitulate, as briefly as possible, the principal articles of my belief. I shall furthermore ask you to refer for a more elaborate statement of my case to my former communications on the subject of reflex and vaso-motor phenomena.*

That portion of the respiratory apparatus known as the naso-bronchial tract is, together with its appendages and connections, frequently the seat of certain periodical vascular disturbances in which paroxysmal explosions of nervous force play a conspicuous part, and which depend, it is reasonable to assume, upon some form of sympathetic or vaso-motor nerve-irritation. The vascular changes

* See especially, "Trans. of the American Laryng. Assoc.," 1884, pp. 113 *et seq.* Papers on Coryza Vaso-motoria Periodica in "Medical Record," July 19 and Oct. 18, 1884; Rhinitis Sympathetica, "Maryland Med. Journal," April 11, 1885; Origin and Cure of Coryza Vaso-motoria, etc., "Trans. of the Medico-Chirurg. Faculty of Maryland," 1885; Review of Morell Mackenzie on Hay-Fever, "Am. Journal of the Med. Sciences," Oct., 1885, pp. 511–528; Production of Rose-Cold by an Artificial Rose, etc., *ibid.*, Jan., 1886.

with their associated nervous phenomena may affect the upper respiratory tract in its entirety, either appearing simultaneously or successively in its different segments, or may be chiefly manifested or localized in some individual portion of the tract (nose, pharynx, larynx, bronchial tubes). In the latter case the nasal cavities and the bronchial tubes are most frequently the areas upon which the nervous shock is expended—the two territories being seemingly held in close reciprocal relationship by virtue of a physiological law of sympathy between the two extremities of a mucous tract. In the one case a sympathetic coryza results, in the other a sympathetic bronchitis.

In the evolution of these reflex phenomena two factors are conspicuously concerned: a depraved condition of the nerve-centers, and an abnormal excitability of certain portions of the naso-bronchial tract.

The derangement of the nervous apparatus may be transmitted from father to son, or it may be acquired in a number of different ways. Thus, for example, it may be the result of prolonged irritation of the respiratory membrane (*e. g.*, from nasal congestion and inflammation, polypi, etc., chronic affections of the larynx, pharynx, and bronchi), leading to repeated and continuous vascular disturbances over certain areas (as, for example, the frequent engorgement of that portion of the nasal cavities covered by erectile tissue), with subsequent abnormal irritation of the nerve-centers. I do not bring this forward as a mere theoretical assumption, but as a fact of personal experience, having been able to trace clinically the development of the neurasthenic condition from simple pathological irritation in the respiratory tract, and notably in the nasal passages.

It thus comes to pass, after a time, that the constant excitation of the nerve-centers by the peripheral irritation so alters their reflex excitability that they respond more readily to reflex-producing impressions. When, therefore, an increase of peripheral irritation occurs, either from extraneous influences or internal causes, a corresponding excitation of the centers is produced which expresses itself in a paroxysm. We might draw a parallel here between this chain of events and the mechanism of the epileptic attack, or the exaltation of the spinal nervous system from abuse or disease of the generative apparatus.

The exalted state of the centers may be conditioned in another series of cases, entirely independently of any local irritative process in the respiratory tract, by a constant wear and tear of the general

nervous system from a multitude of causes—from the faulty nervous constitution which Beard has termed neurasthenia. Such a condition, it is not difficult to imagine, might produce in time a disordered state of the sympathetic and abnormal functional activity of the vaso-motor centers.

In individuals affected with this form of neurasthenia, local organic irritation would be more likely to lead to reflex phenomena referable to the region of the affected part than in those whose nerve-centers had not been subjected to the same amount of functional strain. In the vaso-motor manifestations under review are found simply an application and illustration of this natural law. Or, to put it in other words, the area in which the vaso-motor reflexes occur will depend, other things being equal, on the seat of the local pathological process—on the localization of the area of peripheral irritability. A polypus in the nose, for example, would excite in such a person symptoms referable to the respiratory system, while a similar growth in the rectum would elicit reflex disturbances referable to the lower bowel. Now, as there is no tract more subject to direct irritation from the external world than the respiratory, we should naturally look to it for manifestations of central vaso-motor disturbance, and herein lies the answer to the question which may be propounded: Why is it that these vaso-motor disturbances are so often encountered in the respiratory tract, and notably the nasal passages?

In still another class of cases the excessive irritability of the nerve-centers may find its predisposing cause in pathological states of the system as a whole, as, for example, certain diathetic conditions; or it may be the result of reflected irritation from individual parts of the body.

There are certain diseases that tend to abrogate the functional activity of the nerve-centers, and at the same time show a special proclivity to manifest themselves or leave traces of their existence in the respiratory tract. I might instance gout, rheumatism, certain fevers, syphilis, etc., and it is a clinical fact that the origin of the trouble may be traced to such a source. You are familiar with the fact that vaso-motor coryza was, and is by some at present, supposed to be one of the protean manifestations of gout, from the alleged frequency with which it is encountered in those of a gouty diathesis. If what I have said above is accepted, however, it is scarcely necessary to point out the inadequacy of this theory, and to lay stress upon the proposition that gout enters as a factor into the etiology of the affection only in so far as it is one of a host of diathetic conditions

which lead to weakness of the nerve-centers and inflammatory conditions of the respiratory tract.

In connection with this portion of my subject I should like to call attention briefly to the occasional remarkable behavior of this group of respiratory neuroses under the influence of certain acute diseases. I have observed the whole group of symptoms—coryza, asthma, sneezing, cough, etc.—completely disappear during an attack of acute rheumatism, while in another case a recurrence of the nasal affection and asthma took place during an attack of measles after a prolonged interregnum of immunity from these conditions.

We now come to the discussion of the hyperæsthetic condition of the respiratory membrane. Is this factor constant, is it primary, is it the *fons et origo* of these affections, or is it fugitive and secondary? Is it the result of purely local disease, or is it the peripheral expression of more central nerve-irritation? These questions have an important practical bearing on the treatment.

It seems to me that the existing confusion in regard to these questions arises from failure to separate the hyperæsthesia naturally associated with the local pathological process and the excessive irritability principally met with during the paroxysms of this class of affection. According to my belief, the intense hyperæsthesia characteristic of the paroxysm is, like the vaso-motor phenomena (engorgement, swelling, etc.) which accompany it, a purely secondary phenomenon, and occurs only through the intervention of central irritation or paresis. This characteristic irritability may pass away with the subsidence of the attack, or may be more or less constantly present in the interregnum, according, presumably, to the amount of structural injury which the nerve-centers have undergone. This secondary hyperæsthesia may be brought about, then, if my view be accepted, either by a direct impression made upon the terminal nerve filaments in the respiratory mucous membrane, or by an indirect influence conveyed or reflected through the vaso-motor centers from a distant organ; or, finally, from an excitation starting in the centers themselves.

The hyperæsthesia met with in these conditions may be general, or localized in individual segments of the respiratory tract. In either case, while all portions of the tract as a whole or in part may share in the general hyperæsthesia, there are certain areas in which the latter is usually more pronounced, in which a greater susceptibility to the impressions by which reflex acts are produced is discoverable, and in which may be most conveniently and satisfactorily studied

the vaso-motor manifestations of this special class of neuroses. These are: In the nasal passages, the area covered by erectile tissue, and chiefly that portion found in the lower and posterior portions of the nostril (posterior end of inferior turbinated body and erectile tissue in the septum immediately opposite—reflex sensitive area); in the pharynx, the vault and posterior wall; in the larynx, the inter-arytenoid commissure; and, in the trachea, certain areas along its posterior wall. It is worthy of notice that, roughly speaking, it is the lower and posterior portions of the individual segments of the respiratory apparatus where these sensitive areas have been shown to exist.

According to my belief, then, these affections are intimately related to some disturbance of the sympathetic nerve, and probably a deranged condition of the vaso-motor centers themselves.* The neurasthenic phenomena, whatever the condition may be upon which they depend, may, as has been pointed out above, be due entirely to a primary irritation or well-defined disease in the nostril or in other parts of the respiratory tract, but until this condition is produced the case is simply one of ordinary nasal inflammation, and does not become true vaso-motor coryza until the nervous apparatus is markedly involved. In other words, in considering this affection we are dealing with a neurosis, or, at least, with an affection in which the neurotic element plays the essential and most conspicuous part.

In addition to the arguments already advanced in favor of this view, I desire to call attention to the existence of a hitherto undescribed neurosis of the aural apparatus closely allied or analogous in ætiology, mechanism, etc., to vaso-motor coryza, of which I have seen one case, which will be published in due time. Suffice it to say here that in this affection we have to deal with, if we may thus express it, a sort of hay-fever of the ear. When to this we add the recent observation of Dr. Gradle† concerning a periodical affection of the conjunctiva closely analogous to hay-fever, we have, it seems to me, additional evidence in favor of the sympathetic origin of the affection under review. In vaso-motor coryza the area over which the reflex vaso-motor disturbances are manifested is chiefly the territory which receives its vaso-motor nerve-supply from the sphenopalatine ganglion; in the aural neurosis, the phenomena are localized

* For an elaboration of this point, see especially "Am. Journal of the Med. Sci.," Oct., 1885, *loc. cit.*

† "Am. Jour. of the Med. Sci.," April, 1886.

or more pronounced in the area presided over by the otic; in Dr. Gradle's cases of recurring conjunctivitis the parts involved are supplied by the ophthalmic, and so on.

I would also refer to two additional observations which I have made, and which are of especial interest in view of the probable vaso-motor or sympathetic nature of the affection—viz., the occasional marked swelling of the thyreoid gland, and to an enormously swollen and congested condition of the auricles analogous to that of the rabbit's ear in the famous experiment of Claude Bernard upon the cervical sympathetic.

I have said above that the two areas most frequently and notably concerned in these respiratory vaso-motor disturbances are the nasal passages and bronchial tubes. This leads me to refer briefly to the question of asthma and its relation to nasal disease. To Voltolini is universally and erroneously attributed the credit of pointing out this interesting relationship. That the asthmatic paroxysm is not infrequently associated with or terminated by a discharge of mucus or serum from the nasal passages, is a fact which was familiar in ancient times. Thus, among others, Cœlius Aurelianus,* in speaking of the diagnostic value of an excess of mucus in connection with the so-called "convulsive asthma," after commenting on its various symptoms, proceeds to say:

"*At si gravior impetus superpositionis fuerit, ora ægrotantium livescunt, et quidem excluso per nares humore mucilento, relavantur, atque præfocationis carent metu, quod non aliter cedit, etiamsi per oculos lacrimarum fuerit fluor.*"

He also gives a cold in the head (*gravedo*) as a symptom of asthma. It was not, however, until centuries afterward that Zecchius† described an asthma whose cause he ascribed solely to a catarrh of the head, whose premonitory symptoms were a pain in the head, a distillation from the nose, and a small cough, and whose treatment consisted in the use of the ordinary remedies directed against catarrh of the head. I have called attention, too, elsewhere,‡ to the "suffocative catarrh" of Schneider, and the "anniversary asthma" of Floyer, as bearing upon this relationship. I may add that the asso-

* "De morbis acut. et chron., libri viii"; Amstelodami, 1709, lib. iii, cap. i, p. 430.

† "Consultationes medicinales," Francofurt., 1650, xviii, p. 160 *et seq.*; liii, p. 565; lxxiv, p. 708 *et seq.*—*et in al. loc.*

‡ "Am. Journal of the Med. Sciences," January, 1886, p. 52, foot-note, and p. 53.

ciation of asthma, whooping-cough, and sneezing was also observed by Josef Frank.*

Coming down to more recent times, we find Bree† referring to a case of an asthmatic restored from the disease—

"Whose Schneiderian membrane became unusually dry in the progress of his recovery, and was even affected at this time with inflammation. The fluctuating qualities of the air, often irritating this membrane, occasionally produced a paroxysm without expectoration, until the habit of relapse was at last conquered by the means employed." In another place he observes: "If there have been frequent repetitions of irritating causes and convulsive efforts of the respiratory muscles, the asthmatic paroxysm may much more probably supervene upon the milder effort to reject an acrid particle by sneezing and cough."

Later on, Rudolf Ferber,‡ of Hamburg, referring to the frequent association of sneezing, migraine, bronchial asthma, and hay-fever, advanced the theory that these phenomena were the expression of a neurosis of the trigeminus brought about by circulatory disturbances in the lower pelvis. These led, he thought, to a slowing of the venous current with stagnation of blood in the skin, mucous membranes, nose, etc. This abnormal condition finally begets a disturbance of the sensitive nerves of the parts with a tendency to reflex phenomena, manifesting themselves chiefly in the domain of the trigeminus. Thus the alveoli of the lungs and the mucous membrane of the bronchi become surcharged with venous blood, and this engorged condition probably acts directly on the sensitive filaments of the vagus.

I may mention here a little brochure to which I have never seen any reference, even among German writers, which I stumbled on accidentally in the library of the Surgeon-General's Office at Washington, and which I take pleasure in rescuing from an undeserved oblivion. The pamphlet is entitled "*Die Migraine ist eine Angina, der acuter Magencatarrh eine Neurose. Ueber die Bedeutung der Angina Faucium, ihre Verbindung und ihren Zusammenhang mit einer Reihe von Krankheiten*," and is from the pen of Dr. Ferdinand Wydler, of Aarau. The chief contention of the author is indicated in the title of his work. Among the conditions supposed

* "Praxeos medicæ universæ præcepta," Lipsiæ, 1818, pars II, vol. ii, sec. 1.

† Robert Bree, "A Practical Inquiry into Disordered Respiration, distinguishing the Species of Convulsive Asthma, etc.," Phila. ed., 1811, p. 145.

‡ "Der Niesekrampf u. deren Beziehung zur Migräne, zum Bronchialasthma u. zum Heufieber." "Arch. d. Heilkunde," 10ter Jahrg., Leipzig, 1869, p. 586.

to depend upon slight catarrh of the pharynx are cardialgia, gastralgia, vertigo, vomiting of blood, epistaxis, sopor, delirium at night, hemicrania, neuroses of the trigeminus, cervico-occipital neuralgia, angina pectoris, brachial neuralgia, stenocardia, etc. He concludes as follows:

"Nach meiner Auffassung ist die Hemicranie, sowie die frische Trigeminusneuralgie eine Angina, gleichsam eine fragmentarische Angina, mit den begleitenden hervorstehenden Krankheitssymptomen der einfachen catarrhalischen Angina nervöser erethischen Personen: eine Angina, bei welcher als hauptsächlichste Symptome, Prostration und Kopfschmerz, Schwindel, meistens auch Erbrechen erscheinen, und sich als Hauptleiden hinstellen, die jedoch deutlich von dem Zeichen der Zusammenhörigkeit des Zusammenhangs und Ursprungs, von der frischen Röthung der Schlundgebilde begleitet sind."

While the enthusiasm of the author carries him a little too far, his pamphlet must be regarded as an important contribution to the literature of the naso-pharyngeal reflex. Finally, Trousseau* discussed at length the relation of coryza to asthma, and Follin and Duplay† assert that many of those who suffer from nasal polypi "become subject to attacks of asthma." To Voltolini belongs the credit of curing his patient by removal of the nasal neoplasm.

The older writers, as has already been pointed out,‡ were doubtless familiar with the disease known as "hay-fever," which they considered as a species of, or identical with, the so-called bronchial asthma of the present day. It was not until after the observations of Bostock that the asthma arising from the emanations of grasses was regarded as distinct from the asthma produced by other causes, while it has taken nearly a century for us to return to the simpler classification of the older nosologists. Even now our notions of the condition known as "asthma" are more or less vague and indeterminate. It is looked upon as a disease *per se*, as a distinct pathological entity; but if we consider exactly what is involved in the ordinary conception of this condition—that, like many other disturbances of respiration, it has no definite anatomical lesion, that it is common to an almost indefinite number of pathological states—we shall be forced to regard asthma as a symptom which, like cough, may be ushered in, follow, or occur simultaneously with irritation

* "Clinical Medicine," New Syd. Soc. Trans., London, 1868, vol. i, p. 619 *et seq.*

† "Traité élémentaire de pathologie externe," Paris, 1868–'69, tom. 3, p. 815.

‡ "Trans. of the Med.-Chir. Fac. of Md.," *l. c.* "Am. Journal of the Med. Sci.," Jan., 1886.

in various parts of the body, but which is most commonly symptomatic of some disorder of the respiratory tract. I do not propose, in this communication, to discuss the mechanism of the asthmatic paroxysm; whether it is essentially a spasmodic phenomenon, or whether the bronchial constriction is due to an engorged condition of the mucous membrane analogous to that seen in vaso-motor coryza, a transference, so to speak, of the nasal swelling to the bronchial tubes, are matters which do not come within the range of the present inquiry. While there are many reasons for belief in the correctness of the latter view, which was advanced by Weber,* and which has recently found an eloquent defender in Sir Andrew Clarke,† and while such transference probably does take place in a large number of cases, still it were unwise, in the present state of our knowledge, to eliminate completely the element of spasm as a possible factor in other cases, and to lay down the law that the constriction of the bronchial tubes alleged to be peculiar to this condition can only be brought about by sudden swelling of the mucous membrane.

An interesting feature of a certain proportion of the class of cases we are now discussing is the occasional association of urticaria, asthma, and coryza. And just here I may remark that the relation of asthma to skin affections was familiar long before the days of Trousseau. Thus the illustrious Hoffmann ‡ mentions, as a fact of common experience, that asthma sometimes follows the suppression of a cutaneous rash; and before him Baglivi # had recommended, in such an event, that the patient should sleep with one having the

* "Ueber Asthma nervosum." See "Tageblatt d. 45 Versammlung deutsch. Naturforscher u. Aerzte in Leipzig," 1872, p. 159.

† "American Journal of the Med. Sciences," Jan., 1886. In simple justice to Trousseau, whom some recent writers seem to overlook, it must be stated that he was the first to look upon the peculiar coryza (undoubtedly the hay-fever of the present day) occurring in connection with asthma (see above) as one of the manifestations of that disease, as a part of the asthmatic process, and also the first to suppose that the difficulty in respiration, sometimes associated with urticaria, was "occasioned by an eruptive or congestive state of the mucous membrane of the bronchial tubes analogous to the eruption and congestion on the skin." (*Op. cit.*, vol. ii, p. 284.)

‡ "*Ita experientia docemur, a scabie retropulsa . . . a tinea capitis male curata . . . nostram passionem exoriri.*" F. Hoffmann, "Op. omnia physico-medica," part ii, § ix, p. 257, Genevæ, 1760. In speaking, too, of the symptoms of asthma, he adds, "Mucus per nares excluditur."

"Opera omnia med. practica," ed. octava, Lugduni, 1714, "Prax. med., appendix de asthmate," p. 104. "*Ex scabie retropulsa si asthma fiat, cum scabioso dormiendum est, ut scabies revocetur, vel urticis cedenda cutis.*"

"scabies," that, catching it, he might be relieved of his asthma. It is also related that William of Orange was cured of an inveterate asthma during the running of a sore on the shoulder produced by the famous cannon-ball wound received at the battle of the Boyne.

In the condition of affairs that we are discussing, the coryza may precede the asthma and urticaria in time of appearance, disappearing or remaining after their eruption; or the asthma or urticaria may antedate the attack of coryza; or, finally, instead of alternating the one with the other, they may appear simultaneously in the individual. At the last meeting of this association I stated my belief that these phenomena seemingly depend on an imperfectly defined neurosis or vaso-motor influence (possibly some derangement of the cervico-occipital sympathetic), which is probably the connecting link between these affections. Now, in attempting to define the reciprocal relationship between this triad of conditions, we may regard the skin essentially as a part of the respiratory tract, as the external organ of respiration. It is only necessary for me to recall the physiological importance of the skin in respiration among some of the lower animals, and the embarrassment of respiration in man from pathological or experimental suppression of the cutaneous function. We may accordingly regard this neuro-vascular disturbance of the external surface as a natural symptom of the respiratory vaso-motor neuroses, and assume that, while the relation of asthma and coryza may be explicable by a possible normal sympathy existing between the two extremities of the internal respiratory tract, both asthma and coryza may be linked to the skin affection by a sympathetic bond which holds in equilibrium and close consent the whole mechanism of the respiratory function.

The principles involved in the foregoing propositions have served as the basis and rules of my practice in this class of affections during the past three years, and with a most gratifying result. In that time between sixty and eighty cases of paroxysmal vaso-motor neuroses of the respiratory tract have come directly or indirectly under my professional observation. Of this number, the nasal passages were most frequently the seat of the vascular disturbance, and next in frequency the bronchial tubes and pharynx. Occasionally the affection was more or less clearly localized in the laryngeal cavity, but, according to my experience, this is an exceptional event. While the sympathetic nerve disturbances manifest themselves most frequently in the nasal cavities, in a certain proportion of cases the pharynx

and larynx appear to be the starting-point of the trouble, and I have traced a number of reflex phenomena, such as asthma, cough, etc., to diseased conditions of these structures. The vaso-motor disturbances, both of the pharynx and larynx, are, however, commonly associated with, or preceded by, similar affections of the nasal cavities. In the pharynx and larynx they are characterized by an excessive degree of hyperæsthesia—the very act of opening the mouth giving rise in some cases to retching and even vomiting. Indeed, a considerable number of cases of so-called hyperæsthesia and paræsthesia of the larynx and pharynx are traceable to some vaso-motor disturbance or sympathetic nerve irritation. The changes in the vascularity of the mucous membrane often take place with great rapidity, the vessel dilatation being quickly replaced by a condition approaching pallor, while the latter as quickly gives place to the laryngeal or pharyngeal blush. In cases in which the neurotic feature is especially well marked, the alternate dilatation and contraction of the vessels can be most conveniently studied. The suffusion and swelling may be diffuse and uniformly distributed over the structures, or it may be more pronounced over certain areas, presenting a certain anatomical resemblance to a cutaneous eruption.

The secretion of colorless watery fluid is not so constant nor so abundant as in analogous conditions of the nasal passages, nor is the swelling of the mucous surfaces so conspicuous. The reflex phenomena symptomatic of this class of pharyngo-laryngeal neurosis need not detain us at present. Suffice it to say that they are sufficiently numerous, and consist chiefly of various sensory and motor disturbances in the path of the nerves that radiate from the pharyngeal plexus, and in spasmodic contraction of the pharyngo-laryngeal muscles. In one case the spasm of the pharyngeal and palatal muscles was so great that it materially hindered the passage of air through the nares and laryngeal vestibule, causing the patient to start suddenly from his sleep with what might be termed a veritable naso-pharyngeal asthma.

In whatever portion of the respiratory tract these vaso-motor neuroses are situated, the general principles of treatment are in each and every event essentially the same.

When, some time ago,* I formulated the view according to which the so-called nasal or respiratory reflex neuroses, the group of phenomena known as "hay-fever," "asthma," and other reflex conditions found in connection with nasal disease, may be classed as

* "Maryland Med. Journal," April 11, 1885.

symptoms which, owing their origin to a common cause, form part and parcel of a single pathological process, I did so not merely upon theoretical grounds, but based my conclusions upon the results of clinical experience, upon the observation that the treatment of one of these neuroses was essentially the treatment for all, and whether we had to deal with paroxysmal cough, asthma, or with the *ensemble* of those phenomena known as "hay-fever," "rose cold," etc., the therapeutic indications are identical.

With these brief prefatory remarks, let us turn to the most typical and interesting of these affections, in which the nasal passages and adjacent organs are the most conspicuous seats of the vascular disturbances, and which we may designate coryza vaso-motoria periodica.

The chief indications in the treatment of this affection are: (1) To remove any existing local respiratory disease or irritation; (2) to so alter the nutrition of the nerve-centers that they may not respond so easily to reflex-producing impressions; (3) to search carefully for any pathological condition, systemic or local, which may be regarded as a source of direct or indirect irritation of the nervous or respiratory apparatus, and adopt appropriate measures for its relief. Failing in the above measures, (4) the partial or complete destruction of the vessels or sinuses over the area or areas in which the vascular disturbance is most marked.

I have dilated at length, elsewhere, upon the manner in which these indications should be carried out, and shall, therefore, on this occasion, only offer a few supplementary suggestions.

The first lesson to be learned in the treatment of this affection is that it is a chronic neurosis, and, as such, requires chronic treatment. It should be remembered that the peculiar condition of the sympathetic is, like epilepsy, with the patient by day and by night, in winter and summer, ready at any moment, under favorable conditions, to give expression to its presence by a paroxysm. Any treatment, therefore, undertaken a short while before the expected attack or during its course, is almost wholly palliative, and can rarely, if ever, accomplish any permanent good. And thus the innumerable remedies (such as chloral, belladonna, opium, stramonium, etc.) which have been used from time to time can accomplish no lasting good, and in many cases either lose their beneficial effects altogether, or, in the end, by their constant physiological effects upon the nerve-centers, may tend even to aggravate the predisposition to the affection. In this category I would place cocaine. As I pointed out

some time ago,* and also at the last meeting of this association,† the long-continued use of this drug in the nose and throat begets an increased irritability of these structures, due, probably, to the repeated contraction and consequent fatigue of the contractile elements in the smaller vessels and erectile tissues, which terminates in some cases in a subparalytic condition of these structures, and subsequent puffiness of the membrane. As the habitual use of carthartics eventuates, sooner or later, in constipation, so the prolonged use of cocaine will result, in a certain proportion of cases, in a hyperæsthetic condition of the mucous membrane. In the case of the erectile tissues, it is especially open to the objection that, by bringing repeatedly into play the contractile power of these structures, it may ultimately weaken their walls and lay the foundation for a permanent dilatation of the erectile cells. In calling attention to these disadvantages of its continuous use in these affections, I do not by any means desire to question the many excellent virtues of this remedy. In certain acute affections of the mucous membrane, and for its effect on the nasal erectile structures, pointed out by Bosworth, it is a God-send, but I am convinced that at present it is too indiscriminately and injudiciously employed. In the disease under review, it has in my hands utterly failed to dissipate, except temporarily, its symptoms, or to abridge, in the slightest degree, its course. For a short while amelioration is secured, but, at the expiration of a period varying from half an hour to two hours, the symptoms recur, and the drug has to be used again and again.

My custom is to treat this affection as I would any other chronic disease of the nervous system. The commencement of the treatment, accordingly, should date from the first appearance of the patient for consultation, and terminate, it may be, long after he is apparently free from his disease. I can not insist too strongly on the importance of prolonged and continuous tonic treatment addressed to the nervous apparatus. It may at first fail, and the paroxysms return again and again with all their accustomed severity; but, if it be persisted in, the time will come, sooner or later—provided there is not some incurable lesion—when the intervals between the parox-

* Discussion on Cocaine, May 15, 1885. "Trans. of the Med.-chir. Fac. of Maryland," 1885, p. 189.

† Discussion, June 26, 1885. "Trans. of the Am. Laryngol. Assoc.," 1885, p. 142. I may add that since then Beverley Robinson ("Med. Record," Oct. 17, 1885), Ingals ("Journal of the Am. Med. Assoc.," Feb. 20, 1886), and others, have recorded similar observations.

ysms will be less and less, and the attacks themselves less severe, until finally they cease altogether.

The great mistake which is universally made, it seems to me, is the suspension of treatment upon the termination of the attack, and I therefore wish to emphasize the importance and necessity of continuous treatment throughout the interregnum of fancied immunity from the disease.

In carrying out this remedial course two difficulties will present themselves: the firmly-rooted belief in the patient's mind that there is nothing the matter with him in the intervals of exemption, and his natural discouragement when, in spite of treatment, he may have an occasional return of his old disorder.

The general tonic and hygienic treatment will vary with the individual peculiarities of the subject and the conditions of his environment, and will usually consist, to speak in general terms, of prophylactic measures directed against the development of nervous and catarrhal affections.

Among the many remedies I have tried in the constitutional management of this class of affections, I would mention and recommend arsenic, phosphorus, zinc, quinine, and nux vomica. These drugs may be used alone or in combination for an almost indefinite time, if the usual precautions in regard to their physiological effects are exercised. The following method of administration, although it has failed me at times, has, nevertheless, been so generally beneficial in my practice that I do not hesitate to recommend it for your trial:

(1.)

℞ Zinc. phosphid..... gr. $\frac{1}{16}$;
Quin. sulph..... gr. ij;
Ext. nuc. vom..... gr. $\frac{1}{4}$.

M. Ft. pil. no. j.

S.: To be taken before meals.

(2.)

℞ Liq. arsenic. et hydrarg. iodid., gtt. iij ad v.

S.: In wineglassful water, after meals.

Formerly I used Fowler's solution, but for the past year have substituted the iodide of arsenic and mercury (Donovan's). The quantity of the ingredients should be increased according to the judgment of the physician. Should the physiological effects of any of the remedies manifest themselves, it should be stopped for a week or so, and then resumed in the same or diminished doses.

I may add, in leaving the subject of constitutional treatment, that

for several years I have employed the above-mentioned lines of treatment in simple inflammatory conditions of the nasal passages and throat, and have found them important auxiliaries, especially in the earlier stages of the simple inflammatory process, when the vaso-motor element of inflammation is chiefly evident from the repeated and sudden erection of the turbinated structures.*

I have also seen good effects from the continuous use of the bromides and the iodide of potassium. In two cases I have made use of the constant current (from ten to fifteen cells), placing one electrode over the nape of the neck, and passing the other extremity of the current alternately over the region of the superior cervical ganglion and through the nasal passages. In one, apparent, and in the other decided, relief to the symptoms was obtained. Although my experience with this agent has not been sufficient to warrant me in pronouncing either for or against its use, I consider it, nevertheless, worthy of further trial.

In one case a satisfactory result, as far as the amelioration of the symptoms was concerned, was secured by partial obliteration of the pharyngeal vessels with the galvano-cautery. The patient, a physician, suffered from the pharyngeal variety of vaso-motor neurosis, associated with an abnormally large, swollen, and varicose condition of the veins on the posterior wall. The vessels were cut across in a number of places, and since the operation the paroxysms have been notably less severe.

In regard to the topical treatment of existing nasal disease, I can only repeat what I have said over and over again, that any treatment addressed to the nasal chambers accomplishes one result, and one only —it closes one door against *ab extra* irritation of the nerve-centers. In many cases, it is true, this will be of itself sufficient. The nasal passages may be the sole avenues through which the nerve-centers are influenced, and, with the removal of the irritant and the consequent physiological rest of the centers, the disorder may be apparently, and in the course of time actually, dissipated. But there are other cases in which, from what I have indicated above, such a course will obviously fail. Those of my colleagues, therefore, who consider the removal of the nasal obstruction or irritation as the sole remedy for this disorder, base their belief, it seems to me, upon an incomplete conception of its pathology. The value of the galvano-cautery and other therapeutic measures addressed to the nasal passages will depend, to a large extent, upon whether the existing nasal disease is

* See article by the writer in the "Medical News," Philadelphia, April 4, 1885.

the primary cause of the central irritation, whether it is the sequel of repeated attacks of vaso-motor coryza, or whether it is a purely accidental phenomenon. Whether primary, secondary, or accidental, it always acts as an excitant of the disease, and it is of the utmost importance that it should receive the most careful attention. But it must not be forgotten, at the same time, that behind the nasal, throat, and head phenomena stands the neurosis, and that, until the sympathetic nerve-irritation is overcome, we can not expect to thoroughly eradicate the disease.

Discussion.

Dr. Daly: A number of years have passed, five, I believe, since I had the honor of first pointing out to the profession the pathological relations between nasal disorders and hay asthma, and, although I have not published anything lately upon the subject, I have a number of useful clinical notes that when offered to the profession will go far to uphold the accuracy and merit of what I first brought to your notice at our congress in New York in 1881. I should like to add this remark here: that my subsequent and rather extensive experience has more than borne out the correctness of my original observations. I have purposely kept silent upon this subject these five years, much to the surprise and, possibly, the disappointment of my friends, who looked for other papers to follow the one which first brought my original observations to the attention of the profession through our congress; but I had furnished the stimulus, so to speak, to others, and I preferred to have the accuracy of what I had observed and pointed out to the medical profession put under the crucial test by other and abler men. I was naturally pleased to find that the subsequent observations of my colleagues, who had devoted themselves to the investigation of the heretofore enigmatical cause of hay asthma, were confirmatory of my views. I was especially pleased, nay, proud, that among these distinguished, painstaking, and labor-loving observers were Dr. Roe, of Rochester, Dr. Hack, of Freiberg, Professor Harrison Allen, of the University of Pennsylvania, Dr. Mackenzie, of Baltimore—the talented author of the paper under discussion—Dr. Sajous, of Philadelphia, Dr. Bosworth, of New York, and many others—all of whom have been kind enough to accord to me their support as to the accuracy of my original observations.

You will pardon me, I trust, if I indulge the belief that this work, these investigations and observations of hay asthma, promises to be of a higher practical value to the profession than any other measure accomplished in laryngology in recent years. With such ability as is now brought to bear upon this subject, not to speak of the others who will cast their observations upon this line of study, there must be valuable results. As the matter now stands, I am proud, very proud, to say that,

before I had the honor to point out the existence of local nasal disease in a large proportion of cases of hay asthma, we temporized with our patients by sending them to expensive places of immunity. We now cure our patients, and, if they go away, we let them go as healthful tourists in search of pleasure, and not as invalids to circumscribed geographical limits, exiles, so to speak, and weeping exiles at that.

I therefore, after these five years' observation of what I then first pointed out, again ask the pertinent question, as I did then, "whether we are warranted in believing any case of hay asthma purely a neurosis without *first* eliminating the possible causation due to local structural or functional disease in the naso-pharynx." I would, therefore, most earnestly insist that all cases of this kind be subjected to a most careful inspection of the naso-pharynx and nasal chambers throughout, and if any abnormity is found, that it receive proper local treatment. Look well to the local treatment, gentlemen. Let not constitutional measures be neglected; but they should receive attention AFTER fruitless search for local disease, organic or functional. If this is done, you will cure your patients more frequently than by any other method.

Dr. MORGAN: I have nothing to add to the physiological and pathological features of vaso-motor neuroses of the respiratory tract as elucidated by Dr. Mackenzie. I have given much reflection, however, during the past year to a point which, if properly developed, may in the near future contribute something toward solving at least a few of the mooted questions concerning the ætiology and pathology of so-called hay fever. I refer to anosmia as a factor in preventing the development of hay fever and allied affections. Has any member of this association met with a patient suffering with an essential anosmia who was the victim of hay fever?

I have interrogated many of my colleagues whose opportunities for observation upon this subject were ample, and the reply has invariably been, that they never saw an individual with permanent loss of smell suffer from hay fever. While I do not now venture to assert absolutely that hay fever has never occurred in an anosmic person, I certainly deem the question worthy of careful consideration and future clinical observation. It is a well-known fact that a few at least of the hay-fever patients successfully treated with the galvano-cautery have experienced partial loss or impairment of the sense of smell, and this occurrence has been unjustly urged by some against this method.

How many of those thus cured of hay fever were cured at the expense of olfactory acuteness is what I should like to ascertain, for it bears directly on the question of the prophylactic relation of anosmia to hay fever. I am aware that it is not considered necessary to invade with the galvano-cautery those portions of the nares supplied by the olfactory nerves in order to cure hay fever: nevertheless, it occasionally happens.

My experience with the galvano-cautery in treating hay fever has not been nearly so favorable as that reported by some of my colleagues. My

cures have been few, although the popular methods, local and systemic, were pursued in all their details, and some of the patients were good subjects for treatment.

I despair of curing eighty per cent., as some profess to have done, and, as this is a matter in which every laryngologist is deeply interested, I would ask some of my friends, especially Dr. Sajous, to state his experience in the past, and his present opinion, of the treatment of suitable cases of hay fever by means of the galvano-cautery. I can hardly believe that the cause of hay fever is limited to the nasal passages in eighty per cent. of those affected, and therefore do not think any treatment of a local nature, and directed solely to the nares, can afford any such results.

After all, what is urgently required for the satisfactory solution of this perplexing hay-fever matter, and for the cure of this malady, is, more facts, practical observations, devoid of theory and speculation.

Dr. Sajous: In answer to Dr. Morgan's question, I should expect that loss of smell would be accompanied by lessened sensibility of the mucous membranes, both the power of conducting olfactory impressions, and ordinary tactile sensation, being reduced. If the theory of hyperæsthesia of the mucous membranes over the turbinate bones as the immediate cause of hay fever is accepted, this might be an important point. With regard to the galvano-cautery in the treatment of this disease, I am glad of this opportunity to present the results of my experience. In the earlier part of my experience with this method it was fraught with excellent results—success, I may say, being universal. Last year, however, it was not so good. Whether this was due to improper treatment, to the intensity of the disorder, or to other causes, I do not know; but the results were not so satisfactory as those of preceding years. It was not from want of attention, for I had given the unsuccessful cases the most devoted care. I followed up the treatment from day to day, and I can assure you that nothing was neglected. After attention to local conditions, eradicating hypertrophies, removing polypi, etc., and giving my patients the benefit of all the suggestions so far made by writers in the same field, including cauterization of sensitive spots and even beyond, I do not think that my results could be taken as higher than forty-five per cent. of cures. All were benefited, some decidedly so, but permanent relief resulted only in the proportion mentioned. In one case, which was reported as successful and which was treated two years ago, the patient escaped entirely the succeeding years, but had a mild attack last year. In my work upon hay fever I expressed the opinion that this case had been absolutely cured. Some of my patients, however, have escaped subsequent attacks, and have had no symptoms whatever. One, sent to me by Dr. Massey, of West Chester, who was treated in 1881 by application of acetic acid, has had no return since. I can say confidently, however, that the so-called "rose-cold" cases respond with more certainty to the treatment by cautery and acids, and that I yet consider them as curable in the great majority of cases.

Dr. Seiler: Since Dr. Morgan has asked the question as to the results of treatment of hay fever with the galvano cautery, I may say a few words upon this subject. I am not inclined to be enthusiastic upon any subject, and certainly not upon this method of treating hay fever. At the same time, I think that the explanation of some of the failures in obtaining a good result may be looked for in the suggestion thrown out by Dr. Mackenzie in his paper; it is not always the case that the irritation is situated in the nasal chambers. It may be in the pharynx, or in the naso-pharynx, larynx, or bronchi. Therefore we should carry our examination a little farther than the nose, and, if the case should not yield to local treatment, we should look farther back. A patient came to me two years ago with the statement that he had been treated for hay fever with applications of glacial acetic acid, the result being that he had been free from hay fever, but had suffered all winter with asthma. On examination, I found a large posterior hypertrophy which I removed; during the last two summers he has had no hay fever and in winter no asthma. Here the cause of the reflex irritation was not in the nose at all, but in the naso-pharynx. In my experience the irritation is situated in the nose in about 60 per cent., and of these, by the use of the galvano-cautery, about 75 per cent. have been entirely relieved, and 25 per cent. only partially relieved, so that the attacks still recur, although milder than they were before. In one case a gentleman, an officer in the army, stationed out on the plains, suffered with hay fever so severely that he had to be sent home for treatment. I applied the galvano-cautery very carefully. The next year he was affected, though not nearly so much as the preceding year. The third year brought him back again, and I found some spots of special tenderness in the nasal chambers which I touched, and since then he has been entirely free, although he returned to the plains, where he was brought into contact with irritating dust. I think that the explanation of the failure is often that the cause of the irritation is not in the nasal cavity, but somewhere else, as pointed out by Dr. Mackenzie.

Some of these cases are very curious. Recently I saw a little girl suffering with laryngeal chorea; the barking occurred every fifteen minutes, at night as well as in the day-time, annoying her friends, and worrying her parents nearly to distraction. I examined her nose and pharynx carefully, but could detect nothing. I said that I did not know the cause, but I would treat it anyhow with the battery. There appeared to be a slight hypertrophy upon the lower part of the right inferior turbinated bone. I applied the galvano-cautery, and the cough ceased at once. That was two weeks ago, and her mother said to-day that she had not coughed since.

Dr. Bosworth: As regards the position taken by the author, I must say that I think that the term reflex is made to cover a large amount of ignorance. What do we mean by a reflex disorder? I think that the case just reported by Dr. Seiler is by no means uncommon. We need not look

for a reflex apparatus in order to account for the symptoms. There is direct continuity of surface from the nasal chambers to the bronchial tubes, and there is a relation between the blood-vessels of the larynx and those of the nose, so that a close sympathy exists between them, and anything producing congestion in one place may induce congestion in the other. This is due to the close relation of the structure of the mucous membrane, and is not reflex, whatever reflex may mean. There is a direct connection also between the mucous membrane of the nasal chambers and the lungs, so that nasal obstruction may give rise to asthma. The mucous membrane in this situation also has an important protective influence, and by its hygroscopic qualities modifies the air which goes to the lungs. I believe that the passage of the air over these moist surfaces is necessary for the normal performance of respiration. When this surface is destroyed, the air in passing to the lungs is not modified; and congestions and inflammation of the bronchial mucous membrane result. This is not theory; it is based upon clinical observations from day to day.

A single application of chromic acid to the nasal chambers may relieve cough or difficulty of breathing at once. I say this not from a single observation, but from numberless observations. It is a question with me whether or not, in the future, I shall drop this term reflex, and acknowledge a direct symptomatic relation only in the explanation of these phenomena.

Dr. Langmaid: I have been much interested in the discussion, but must say that I can not accept Dr. Bosworth's explanation.

Dr. Shurly: I agree with Dr. Langmaid. It is indeed a startling theory which gives such predominance to the locality of the nose. The vaso-motor nerves regulating the blood supply, of course, have a great deal to do with the blood circulation in all parts of the body. We might go still further upon the theory just advanced, and conclude that disturbances of circulation in the turbinated bodies might cause other of the diseases of the lungs, as well as simple bronchial catarrh. It is undoubtedly a fact, as Dr. Bosworth has said, that there *are* cases of bronchial irritation and bronchial inflammation which are the result of primary disease in the nasal passages. But I believe that such cases are more exceptional than common. The idea that diseases of the lungs in general are, or may be, products of local conditions of the nasal passages solely, seems to me preposterous, when we so often find various diseases of the lungs or larynx even without notable abnormal changes in the nasal passages. Therefore, it would seem almost too much to expect of us to accept at the present time, in the face of our knowledge concerning the nervous connection and influence between the various parts of the body, the notion that specific diseases or inflammations of remote organs are the result or effect of local disease of the nasal passages. Now, in Dr. Seiler's case, who can tell whether or not an application of the actual cautery to the back of the neck, instead of the nasal mucous membrane,

would have been followed by the same result? Who can adequately explain the action of a blister in relieving pain or internal pathological processes? Everybody must have seen cases frequently in which counter-irritation promptly relieved pain or grave symptoms of disease, either temporarily or permanently. I therefore can not understand Dr. Bosworth's aversion to the admission of a reflex agency.

Dr. Mackenzie: The points raised in the discussion are fully explained, it seems to me, in the paper I have just read, and in various other contributions, but more especially in my review of the subject in the "American Journal of the Medical Sciences" for last October.

Absolute anosmia would certainly prevent the operation of an exciting cause acting through the olfactory sense; but it should be remembered that the latter is only one, and that an inconstant one, of a host of avenues through which the sympathetic may be affected. Indeed, if the views expressed in my paper are accepted, it is scarcely conceivable that absence of the sense of smell could afford immunity against the disease.

I am thoroughly impressed with the importance of attention to the nasal cavities and other portions of the air tract, and, should local respiratory disease be the primary cause of the affection, its removal, with the consequent physiological rest of the centers, may be alone sufficient to secure prolonged immunity from the disease; but I can not too forcibly insist upon the necessity of strict attention to the nervous apparatus, and that not only during the period or paroxysm, but continuously throughout the interregnum of so-called immunity. In carrying out any form of treatment, I can not too often insist upon the separation of the phenomena which are the natural concomitants of the local pathological process and those which are secondary and dependent upon more central disturbance.

I have already sufficiently indicated the fallacies involved in the theory which attributes periodic vaso-motor coryza and allied affections to simple nasal obstruction. In regard to Dr. Bosworth's recent defense of this proposition I must say, if he will allow me to differ with him, that I deny the existence of the physiological ideas which he advances; while, even admitting their existence, they are thoroughly inadequate to account for the most common phases of the disorder. This view, therefore, violates the two most essential criteria of a logical hypothesis—the facts do not exist, and the assumption is inadequate to even partially explain the phenomena. To take one of a multitude of illustrations: how could rarefaction of air in the bronchial tubes, the result of nasal obstruction, account for the sudden and immediate production of a paroxysm of asthma from the simple contact of a probe with the nasal mucous membrane, a result which I have several times observed? If there is one physiological fact which is established beyond the possibility of doubt, it is the fact of reflex action, and we should be going far out of our way in forsaking this simple and rational explanation for the skepticism and speculations of my friend Dr. Bosworth.

In regard to prognosis, I can only repeat what I said elsewhere: that

it will depend not only upon the nature of the predisposing and exciting causes of the affection and the facility with which they may be removed, but also upon the amount of structural injury done to the respiratory apparatus, to the central nervous system, and to other parts of the body included in the arc of the reflex vaso-motor disturbance. I have found children much more amenable to treatment than adults, although the severest types of the disease often occur at an early period of life, and in the management of this class of cases I have been, as a rule, successful. Each case must be studied on its individual merits; we can not, therefore, lay down any definite rule to be followed in all cases.

Paper.

INFLAMMATION OF THE ANTRUM.

By BEVERLEY ROBINSON, M. D.

THIS subject was brought before the association four years ago by Dr. William H. Daly, of Pittsburgh. At that time our colleague reported two interesting cases of this kind, apparently due to extension of inflammation from the nasal passages. Until two years ago I have not had the opportunity to treat any such cases, and it was only last summer that I met with a first case of suppuration of the antrum. Fortunately, I then saw an example of this disease, and was able to carry out, conjointly with Dr. C. A. Brackett, of Newport, R. I., the treatment detailed in the following history:

On July 3, 1885, Miss K. B., single, twenty-five years old, consulted me at the request of my friend, Dr. John F. Ridlon, of New York, in regard to a purulent discharge from the left nostril. This discharge had already persisted during four to five weeks, and despite appropriate general treatment. Little or no local medication had been employed at the date I first saw my patient. On that occasion she was pale, nervous, and suffered considerably from neuralgic pains in the left cheek, orbit, and over the eyebrow. The nasal mucous membrane on the left side was red and swollen, and the occlusion was so great as to render respiration through the corresponding passage impossible. A small quantity of thick, purulent liquid was almost constantly oozing from the left nostril, which could be removed when it appeared by wiping it away, but could not be blown out of the nostril because of the obstruction occasioned by the infiltration of the soft tissues covering the septum and lower and middle turbinated bodies. The left naso-labial furrow was less marked than that on the right side, and the left cheek was somewhat swollen. The color of the skin in this region was unchanged. Moderate pressure over the left antrum occasioned evident pain. There was no apparent bulging of

the antrum in any direction. The hard palate was normal, and there was no alveolar abscess. The teeth in the upper jaw on the left side were filled, the first bicuspid with a gold filling, the first and second molars with amalgam fillings. The second bicuspid and the wisdom tooth had been extracted some time previously. Upon examination of the mouth by a competent dentist, a short time before my patient first came to me, the teeth remaining in the upper jaw had been declared to be free from disease, and were not painful to moderate percussion with a steel instrument. There was no swelling or other indication of a forming abscess near any one of them. From July 3d to July 27th I treated Miss B. in the following manner: At first, by means of a salve introduced through the left nasal passage two to three times a day, composed of camphor, cubebs, vaseline, and glycerin, and internally by wine of coca and pepsin. After a week had elapsed, Bland's iron pills were substituted for the preparation of coca and pepsin, and a powder was insufflated into the left nasal passage several times daily with the anterior nasal powder-blower.

The powder was thus composed:

℞ Pulv. acid. tannici..... gr. vj;
Pulv. camphoræ..... gr. xxx;
Pulv. iodoformi..... gr. xxv;
Pulv. cubebæ..... gr. xv;
Pulv. acaciæ.....ad ℥ ss.
M.

On July 27th the left cheek became more swollen at its lower portion, and the gum around the second upper molar tooth on the left side was inflamed and sensitive. The tooth itself was somewhat movable, and slightly painful on moderate pressure. It was determined, in consultation with Dr. C. A. Brackett, to remove the tooth and perforate the left antrum. This operation was accordingly performed by Dr. Brackett on the day just mentioned, while the patient was under the influence of nitrous oxide gas. The antrum was then washed out with a disinfecting solution by means of a small metallic syringe with a long, fine nozzle, and a portion of the detergent liquid passed out through the left nostril, carrying before it a small quantity of purulent discharge. After the antrum had been sufficiently cleansed, a cotton tent was introduced through the opening into the antrum. During and subsequent to the injection Miss B. suffered a great deal of pain, and was obliged to take half a grain of morphine that night to induce sleep. Two days later, as the injection into the antrum and the removal and introduction of a tent appeared unusually painful, cocaine, in four-per-cent. solution, was used hypodermatically in the gum and antrum to the amount of sixteen minims. This injection only allayed the pain of the cleansing to a slight degree. On July 30th, Dr. Brackett again gave our patient nitrous oxide gas, enlarged the opening into the antrum by means of a small burr attached to

the dental engine, and afterward washed out the sinus readily, effectually, and painlessly.

The liquid thrown into the maxillary sinus on this occasion came freely out of the left nostril, and carried before it the pus contained in the antrum and the left nasal passage.

July 31.—Nitrous oxide gas inhaled. Injection through the antrum not entirely successful, as it did not appear in the left nostril, but returned through the alveolar fossa. Tent reintroduced.

August 1.—No pus withdrawn when the tent was taken out. Injection perfectly successful, forcing before it a quantity of inspissated pus with a markedly offensive odor.

Tent reinserted. Left nasal passage still much occluded; pus continues to come from it in considerable quantity, although somewhat diminished since the injections were begun. The injections still occasion severe neuralgic pains, radiating in different directions, and especially toward the left orbit, the left ear, and the teeth of the lower jaw on the affected side. As the injected liquid does not pass into the pharynx, which is common in analogous cases, but flows out through the left nostril, it is probable that the main occlusion in the left nasal passage exists posterior to the nasal orifice of the antrum. Examination with a probe serves in part to confirm this belief.

3d.—Nitrous oxide gas administered yesterday and to-day. Opening into the antrum further enlarged with a dental burr. Injection of antiseptic fluid followed.

Reinsertion of tent, soaked in tincture of opium. Patient suffered acutely yesterday evening; relieved by half a grain of morphine internally. To-day one drachm of salt to a pint of warm water was used as an injection by means of the continuous douche-bag, raised to a considerable height. The injection was continued until the solution came freely through the left nostril and was perfectly clear. Patient acknowledges that the left nasal passage is now comparatively pervious.

5th.—Patient passed a comfortable night, and was *not* obliged to take an anodyne. The discharge from the nose is much less, and she can blow it easily and satisfactorily. Her general condition has greatly improved.

10th.—Tupelo tent introduced through alveolar cavity, instead of cotton tent; washing continued; daily improvement.

11th.—Washed out antrum with tincture of iodine and salt water, the proportion being half an ounce of the former to a pint of the latter.

19th.—Discharge from the nose had diminished so much that the tent was finally withdrawn, and the injection into the antrum stopped.

In the case narrated, the patient's general condition was evidently poor, and she was a sufferer from dysmenorrhœa and leucorrhœa. There is no doubt that the predisposing cause of the suppuration

of the antrum should be recognized as being the deterioration of the blood. It is obvious, however, that the extracted molar tooth, whose palatine fang was diseased, was the efficient or exciting cause of the local inflammation. Such examples, I am informed, are not very infrequent in dental practice. They rarely show themselves or are treated in throat clinics, and, as the method reported in detail is simple and rational, and proved curative, I am confident that the history is one of some interest.

Another case of suppuration of the antrum I saw in October of last year. The patient was sent to me by Dr. D. B. St. John Roosa, of New York, and was accompanied by his usual medical adviser, Dr. Hagadorn, of Gilboa, New York.

E. J., thirty-one years of age, married, day-worker, has had a purulent discharge from the right nostril during the last six months. One week ago a slight similar discharge from the left nasal passage was also noticed. In warm weather the discharge from the right side of the nose becomes thin. At times the discharge is alternately mucous and purulent in character, and, with this variation, lasts during several days. Every morning, at present, about a tablespoonful of liquid comes away from the left nostril, or from both nostrils. To-day the discharge was wholly purulent.

There is no pain or swelling over the cheeks. My patient suffers, however, considerable distress from pain over the eyes. The purulent discharge flows from his nose, at times, when he inclines his head forward. This fact has been verified by his family physician. Patient is of the opinion that the purulent discharge has diminished in amount during the past month, under the use of medicated sprays applied frequently to the nasal passages. Some months ago he suffered from vertigo, and even now he has dizzy or other unpleasant sensations in the head, which are difficult to define, whenever he moves his lower jaw suddenly. Upon rhinoscopic examination, both middle turbinated bodies are found to be much swollen, and the right nasal passage contains abundant purulent liquid. This secretion flows into the naso-pharynx, and is there visible. Except for the presence of pus, the throat is in a healthy condition. On careful examination no necrosed bone can be detected in any part of the nasal passages. The wisdom tooth of the upper jaw on the right side is carious. There is, however, no tenderness or swelling in the vicinity of this tooth. The diagnosis made is suppuration of the right antrum. The following treatment is advised: Cauterization of the right middle turbinated body by means of chloro-acetic acid after a cocaine spray has been used; thymol spray twice daily, so soon as the immediate effects of the cauterization have subsided. In the event of the purulent discharge continuing, extraction of the carious wisdom tooth is counseled, to be followed by perforation and washing of the right antrum.

On May 11, 1886, Dr. Hagadorn wrote me word that this patient was decidedly better. There is, at present, no discharge from the right nasal passage except, as he expresses it, when "he takes cold." Dr. Hagadorn further writes that this patient did not have his wisdom tooth extracted, and he presumes the antrum has nearly or quite healed, from the fact that there is no discharge whatever except as stated above, and the tenderness over the site of the antrum has entirely disappeared. The plan of treatment followed from the time I saw him until January 1, 1886, consisted simply in spraying the nasal passages daily with a mixture of tannin, glycerin, and carbolic acid. Since January 1st this patient has stopped all treatment.

In connection with the foregoing cases of suppuration of the antrum, I desire to refer briefly to a case of mucous inflammation of the antrum, in which the disease never reached the stage of suppuration; there was no carious tooth (although the first molar tooth was dead), and it seems to me probable that the antral affection was a direct extension of the catarrhal inflammation from the nasal passages.

W. E. H., mining engineer and hotel-keeper, single, twenty-six years old, resident of New York, was placed under my care by Dr. William T. Bull, in March, 1884. This patient had suffered more or less from nasal catarrh since he was ten years of age. He has had an acute attack during the past week. Except for this attack he has been freer from catarrh this winter than he has been during the past two to three years. My patient states that he always gets rid of his catarrh so soon as he visits the Rocky Mountains or the Pacific coast. When he is in that high, dry air, he feels much better, and only commences to suffer again from nasal catarrh when he comes to the eastern sea-board. Marked headache always accompanies an acute attack of nasal catarrh. This headache does not leave him until he has a moderate or profuse discharge from the left nostril. The discharge is transparent, but yellow in color. Twelve years ago he had a gelatinous polypus removed from this passage; at present there are no traces of it. Accompanying the acute attacks of nasal catarrh, pains shoot down from the forehead into the eyes and teeth; soon they become general. At the same time there is an abundant yellow mucous discharge from the left nostril every three or four hours. Usually it occurs when the head is inclined to the right and downward. It only takes place during the progress of an acute attack of nasal catarrh, and shows itself in two to four hours from its inception. Before the mucous discharge is noticed, the patient has pain over the eyes and through the antra. The pain in the region of the left sinus is more accentuated than in that of the right. The pain is of a

dull, heavy character, and never very intense. The eye teeth become very sensitive. The eyes themselves are unaffected. Ordinarily there is a very unpleasant taste in the mouth during the course of the acute attacks. The smell is obtunded at these times, and sometimes noises in the ears are quite distressing. These noises are most intense in the left ear. Vertigo is an occasional symptom. Each attack lasts three to four days, and recurs several times during the winter. Attacks of sneezing and snuffling usher in the acute attacks, and these symptoms are apparently caused by taking cold. A cold taken always attacks the head and face sooner or later. When the acute nasal trouble has subsided, there still remains a fullness in the nose, with more or less snuffling, and a bad taste in the mouth. The breath does not become fetid. Digestion is normal. I prescribed one granule of hydrarg. bichlor., gr. $\frac{1}{60}$, three times daily after meals, and an ointment of carbolic acid and vaseline for the nose. On February 10th, three days later, my patient had improved somewhat. I made use of iodoform and bismuth through the nose by means of my powder-blower, and repeated the previous prescriptions.

February 18th.—I cauterized the left nasal passage with glacial acetic acid.

March 6th.—There was some difficulty in passing a soft metallic sound of medium diameter through the left nasal passage, because of submucous infiltration. Insufflation of iodoform through the nasal passages anteriorly, and application of a mixture of iodine and glycerin (one part to two parts) to the naso-pharynx. I prescribed unguent. iodoform. and caps. cubebæ. Patient complains of crackling sensations in his ears.

10th.—Repeated everything.

18th.—Schneiderian membrane more inflamed. Powdered magnesia insufflated through the nose.

From this time until May 2, 1886, somewhat more than two years later, I did not see my patient. He then called upon me, and informed me that, since I had treated him, he had had no return of antral inflammation. Occasionally he had had an ordinary coryza, with slight pain over the maxillary sinuses, but he always recovered from these attacks without experiencing periodic and abundant discharges from the nose. In this case I believe the inflammation of the antrum was nearly concomitant with that of the nasal passages. In some of the attacks it is possible that this extension only took place subsequently by reason of continuity of a similar structure. Why such inflammation rarely, or never, goes so far as to produce suppuration, is explained by the fact of the ready exit of the mucous secretions by the orifice of the antrum into the middle meatus. Salten has shown that this aperture, although usually very small, is nevertheless of variable dimensions, and may be occasionally an

opening of moderate size—so large, indeed, as to admit the tip of the finger. It is clear, from clinical and anatomical evidences, that sufficient drainage from the inflamed antrum takes place under ordinary conditions to prevent suppuration.

Suitable mild local treatment of the nasal passages is also conducive to a cure, and in this case was seemingly effective. More than once I hesitated with respect to its utility, and dwelt on the advisability of puncture of the cavity, and subsequent washing by means of antiseptic or astringent solutions. As the result shows (in this and the previous case), this was unnecessary; and in a similar instance, hereafter, I shall not be disposed to undertake it, so long as suppuration does not occur.

Cases of antral inflammation in which there is a periodic discharge of mucous fluid from one or both nasal passages, as a direct consequence of hypertrophic or atrophic nasal catarrh, are rarely met with. This is so true that, with a favorable opportunity of seeing such instances, if they really occur, I can not now recall any one except the example reported. That occasional congestion, however, of the maxillary sinuses does take place during the progress of certain cases of nasal catarrh, acute or chronic, I have little doubt. Such a condition is marked by weight, stuffiness, and dull or aching pain over one or both antra. Although these symptoms may become manifest, rarely do they change, or progress so as to become characteristic of advanced inflammation.

Thus it is, even with such congestion, that the discharges from the nose are not unlike what we notice in numerous cases of ordinary pituitary inflammation.

Perhaps the experience of others is very different from mine. If so, I shall be glad to become familiar with it. As to suppuration of the antrum, I have yet to meet with a case in which the direct extension of the disease from the nasal passages had evidently occasioned it. This is a singular fact, and to me somewhat unaccountable, especially in view of articles in late works on surgery which deal with the subject, and in which this ætiology is distinctly referred to as being present. Theoretically, such a sequel would be only natural, if attention were solely directed to the probable occlusion of the antral orifice, in the middle nasal meatus, as a usual result of inflammatory secretions. I can not, however, believe that this consequence often occurs, except in those instances in which there is discovered a carious tooth, alveolar abscess, or bone disease of the superior maxilla.

As a point of some practical interest, I would refer to the fact of the rapid closure of the artificial opening into the antrum, unless it is kept moderately distended by a tent of some kind. Of course, as has been done already on several occasions, a cannula fixed to adjacent teeth may be inserted; but, as this cannula should be plugged between the times of washing, so as to prevent the entrance of food and liquids into the sinus, its great or special utility is not obvious in every case—and, moreover, a suitable cannula is not always at hand when the occasion demands it.

Note.—It may perhaps be of some additional interest to the reader to know that I have now (February, 1887) under my care another case of suppurative disease of the left antrum, apparently caused by a diseased molar tooth. This case is being treated by me in a similar manner to the first case reported in my paper, *i. e.*, by daily washing of the antral cavity with an antiseptic solution, the offending tooth having been previously extracted and perforation effected with a dental burr through the alveolus.

Paper.

A CASE OF NASO-PHARYNGEAL GROWTH.

By SAMUEL JOHNSTON, M. D.

THE following case may prove not uninteresting, as illustrative of one of the possible accidents which may happen to embarrass the surgeon during the operation for the removal of naso-pharyngeal growths with the écraseur:

J. W., twelve years of age, a well-grown boy, though of abnormally nervous temperament, came under my care some months since for the treatment of so-called nasal catarrh. His most prominent and distressing symptoms were complete inability to breathe through the right nostril, headache, and a discharge of mucus into his mouth, necessitating the constant clearing of his throat with the peculiar noise characteristic of that effort. His mother stated that "from childhood he had seemed to have something the matter with his nose"; but only since April last, when he had scarlet fever, had his difficulty in breathing through that channel grown more decided. He had never been subject to nasal hæmorrhage, but at times he would expectorate mucus tinged with blood. When I first saw the boy his general health was excellent, and, with the exception of a peculiar intonation of his voice indicative of some obstruction to free nasal respiration, there was nothing to attract notice either in his general appearance or otherwise. Examination of the nasal passages anteriorly showed the absence of the more common impediments to free respiration, and an unobstructed left nasal fossa; but the right one was

completely occluded at its posterior extremity, where a fleshy looking growth was visible. Posterior rhinoscopy showed the existence of a tumor nearly filling the naso-pharyngeal space, with its most dependent portion resting upon the velum palati. The portion of the growth visible in the mirror was round in shape, firm to the touch, and pink in color, resembling very closely a fibroma in appearance. The removal of the growth was advised, as offering the only chance for relief. After a short preliminary treatment, instituted to accustom the patient to the use of instruments, and also to diminish the dread that he felt of any surgical interference, I decided to remove the growth with the écraseur. On March 23d, with the kind assistance of Dr. John N. Mackenzie and Dr. H. S. Bowie, after using a spray of a four-per-cent. solution of the hydrochlorate of cocaine as a local anæsthetic, I operated in the following manner: A loop of fine steel wire was first passed through the left nostril, and as it appeared in the pharynx it was seized with a forceps and drawn out through the mouth. Into this loop a stout thread, well waxed, was inserted, and the wire withdrawn through the nostril, leaving the thread in the nasal passage. This precautionary measure was taken, in order that, should hæmorrhage of any magnitude occur during the subsequent steps of the operation, a plug could without delay be quickly inserted into the naso-pharynx. A piece of No. 5 piano-wire, eighteen inches long, was doubled upon itself and passed through the right nostril beyond the growth into the pharynx. The loop was enlarged with the forceps and, with the rhinoscopic mirror in position, was guided over the body of the tumor. Traction now being made on the ends of the wire, the loop was soon lost to sight, and the attachment of the growth surrounded. The écraseur was now threaded with the two projecting ends of the wire, the shaft pressed well down against the tumor, and the screw put in motion. From a quarter to half a turn of the screw was made every few minutes, and when the patient complained of pain, the cocaine spray was again used. Until this time nothing had happened to lead us to imagine any other than the speedy termination of the operation, although the resistance offered to the wire was very considerable. When the tumor, however, had been cut through about two thirds of its extent, as nearly as I could judge, a most embarrassing and unprecedented accident occurred. The shaft of the écraseur broke in two with an audible snap near its contact with the growth. The instrument was at once withdrawn from the nostril, and every effort possible made to recover the remaining fragments of steel, but without success. Another écraseur was adjusted, but the ends of the wire slipped from the binding-screw. Fearing to further complicate the situation, as the patient was becoming very restless, I decided to postpone any further interference or attempt to remove the wire for a few days, hoping that in the mean time the growth would slough off. After waiting for four days without any change in the situation, although the vitality of the growth, both from its appearance in the mirror and from the fœtid taint of the patient's

breath, was known to have been destroyed, I concluded to complete the operation with the galvano-cautery; but before using the cautery loop, as there were many uncertainties and difficulties in the way of its successful operation, I reconsidered my first intention, and determined to try once more the écraseur with the original wire. The instrument was attached, half a dozen turns of the screw, without much resistance being offered, bringing the wire through the growth. Shortly after, the broken fragment of the écraseur came out through the mouth; it measured eighteen millimetres in length and about two millimetres in diameter at the point of fracture. An effort was now made to remove the tumor, but from some cause or another it was too firmly fixed in its position to be dislodged. Six hours after, however, it became loose, and was easily withdrawn with the forceps through the mouth. The tumor measured an inch and a half through its long axis, and an inch across its thickest portion. Its base measured half an inch.

During the operation only enough blood to stain a few small napkins was lost. Examination of the naso-pharynx showed the growth to have had its attachment to the vomer and the body of the sphenoid bone, where the stump of the growth was still to be seen. The following is the report of Dr. Councilman, who examined the growth for me microscopically:

Johns Hopkins Hospital, Baltimore, *April 8, 1886.*

Dear Doctor: I made sections across the thick part of the growth, and longitudinally along the thinner portion. The tissue is that of a most typical fibroma. In the larger portion the vessels are small, and in many cases apparently in process of obliteration. In the smaller there are numerous large venous trunks (sinuses?), with the fibrous growth between and compressing them. Very truly yours,

W. T. Councilman, M. D.

The subsequent treatment of the case consisted in the use of cleansing lotions to the nostrils and the application of the galvano-cautery to the stump of the growth. Some days since, when I saw the patient, he was breathing with perfect comfort through both nasal fossæ, and seemed strong and well. The site of the growth was, however, still noticeable upon rhinoscopic examination.

Dr. Lincoln, in two papers read before this association ("Transactions of the American Laryngological Association," 1879, pp. 247–253; *ibid.*, 1883, pp. 86–112), has graphically described the treatment of naso-pharyngeal fibromata with the galvano-cautery loop, and I do not here propose to enter into the discussion of the respective merits of the two methods of treatment. But, as the galvano-cautery may not always be available, I wish to add this contribution to the list of cases illustrating the successful removal of naso-pharyngeal fibromata with the écraseur, and also to record an accident which, so far as I know, is unique.

Paper.

ALARMING HÆMORRHAGE AFTER TONSILAR EXCISION ARRESTED BY TORSION OF THE ARTERY.

By CLINTON WAGNER, M. D.

SERIOUS hæmorrhage after tonsilar excision, when we consider the frequency with which the operation is performed, is of very rare occurrence. In a paper entitled "Habitual Mouth-Breathing," which I read before the Medical Society of the County of New York five years ago, I stated that an experience embracing over five hundred operations without an accident strongly inclined me to the opinion that tonsilar excision was almost devoid of danger.

Since then I have performed the operation very many times, and, with the exception of the following case, I have encountered no accident.

At the Metropolitan Throat Hospital the operation has been performed seven hundred and forty times without accident; and numerous other institutions which have clinics for diseases of the throat can, I have no doubt, show similar immunity from hæmorrhage.

Madame B. F., aged about thirty, an opera-singer by profession, consulted me for sore throat. I found the left tonsil greatly enlarged, and she informed me that it frequently became acutely inflamed. I recommended excision. The gland was partly covered anteriorly by the column of the soft palate, and extended so far downward into the pharynx that I had great difficulty in encircling its inferior portion within the ring of the guillotine; finally I succeeded in removing almost the entire gland. A gush of blood followed, but apparently not greater in quantity than is usual after this operation. The bleeding increasing instead of lessening, I applied to the cut surface of the gland the persulphate of iron, which failing, I resorted to compression, but I discovered afterward that it had not been exerted in the proper direction. Nearly an hour had elapsed since the operation, a large amount of blood had been lost, vomiting of the blood, which had found its way into the stomach, ensued, and the patient was rapidly losing strength. I cleansed the parts thoroughly of clots of blood, but, not finding the source of bleeding, I forced the tongue, by means of the depressor, upon the floor of the mouth as far as possible. In the space between the pillars of the soft palate, apparently springing from the root of the tongue, I discovered an artery of considerable size, bleeding freely and with such force that the blood was projected over and beyond the depressed tongue to the opposite side of the mouth. The bleeding vessel, now located, was, without much difficulty, taken up

with an artery-forceps and twisted, and all further hæmorrhage was effectually controlled. I think the divided artery was either the tonsilar branch of the facial, or the largest of the pharyngeal branches of the ascending pharyngeal, both of which are given off from the external carotid.

Had my patient been a struggling, unruly child, I can readily conceive that the result might have been fatal. Under such circumstances, I think the hæmorrhage could only be arrested by having the child forcibly held, a gag introduced to keep the mouth open, and sufficient chloroform rapidly administered to stupefy and overcome resistance on the part of the child; the tongue well depressed, the artery could then be seized and held for a few minutes with the artery-forceps; this failing to arrest the hæmorrhage, a ligature to the common carotid would be necessary to save life.

In regard to instruments, for the past eleven years I have used Mackenzie's modification of Physick's guillotine. Formerly I preferred the Fahnestock instrument. Two accidents occurred which caused me to regard it as unsafe. On one occasion the fork, which is intended to pierce the tonsil and draw it from its bed, managed to get under the knife. With great difficulty I withdrew the instrument and made a second attempt, which succeeded.

During another operation the fork again found its way under the blade and broke off.

In the "Medical Record," April 24, 1886, the correspondent at Amsterdam mentions a similar accident as having occurred in the practice of Dr. Guye with the Fahnestock instrument.

Paper.

WHAT CASES OF NASAL CATARRH REQUIRE SURGICAL TREATMENT?

By CLARENCE C. RICE, M. D.

THIS subject has received as much attention from this association as any other, if not more, during the past three years, and I am aware that newer, fresher topics would be more entertaining. That there is no unanimity of opinion here in regard to the frequency with which surgical measures are required in the treatment of catarrhal inflammations of the nose, I think we all know. The discussion on this subject by the members of this association one

year ago will show that there were almost as many opinions as speakers. Dr. J. Solis-Cohen, who has had large experience in the treatment of nasal disease, concludes that "in keeping the parts clean and in caring carefully for the patient's general health" he is doing the maximum for the cure of nasal inflammations. Dr. Daly, of Pittsburgh, is quoted as saying that "when we become more throat surgeons and less throat doctors, we shall get better results in the treatment of our cases." A number of the gentlemen last year expressed it as their opinion that there had been, and there still was, a tendency to do too much cutting and burning and boring and snaring, while others contended that in these very methods we had the most efficient therapeutical means in the treatment of catarrhal diseases of the upper air-passages. To me this diversity of opinion is not at all discouraging in endeavoring to arrive at the correct principles which should regulate the treatment of nasal catarrh. I believe that the members of this association are more agreed in their actual methods of treatment than the various opinions expressed by them would indicate.

In the treatment of nasal disease there is a middle ground between the local application of mild remedies on the one hand and radical surgical measures on the other, where we can safely stand. No surgical method is to be shunned completely because it has been employed too frequently, or because it has been at times improperly followed. I have seen disastrous results from the use of the galvano-cautery, and yet I am fully in accord with a statement made at our last meeting by our president, Dr. Harrison Allen. He said that he "believed that the galvano-cautery was the best single agent at our command to relieve nasal disease." One reason for the large increase in the use of surgical methods in our specialty is undoubtedly due to the more perfect diagnosis of diseases of the nasal chambers, which has been made possible by improved methods of investigation, for the instruments we have for the diagnosis of nasal disease are to-day most complete. (Such a thorough illumination of the upper respiratory passages can now be effected, by means of strong, well-directed lights, that disease in these parts is readily discovered.) The addition of the electric light (the electric laryngoscope and post-nasal electric lamp) and the wonderful drug, cocaine, as means of diagnosis, to the equipment of the rhinologist, leaves little to be desired. The use of cocaine has, in a measure, revolutionized nasal therapeutics, for, whereas before it was discovered an examination of the nostrils showed nothing but hypertrophied tissue over the turbinated

bones, guarding the entrance to the nostrils and preventing further inspection, now this obstructing tissue can be pushed aside, and the entire nasal cavities are visible. The case now perhaps presents entirely new and unexpected features; exostoses of the septum, polypi, or hypertrophies of the soft structures are seen in the posterior half of the nasal chambers. Surgical measures are more frequently employed than formerly, too, because better methods of examination now more clearly disclose the *causes* of inflammation which can not be removed by the older methods of spraying and douching. This, after all, is the most difficult part of the physician's work, to locate and determine the precise character of the pathological condition. If we were all agreed as to the local predisposing and exciting causes of a catarrhal inflammation, we should also probably be agreed as to the best method for removing them. With the recently invented and convenient forms of the electric cautery, hot and cold snare, drills, forceps, and cutting instruments, there are few nasal hypertrophies or obstructions which can not be easily reached and removed. In fact, surgical measures in this department are so much more easily carried out than they were a few years since, perhaps the temptation is frequently great to cut and remove too much tissue from the nasal passages, in the endeavor to make straight channels of what were intended, and with great wisdom, to be curved, tortuous passages. There comes a time in any line of surgical practice when, after rapid progress in means of diagnosis and great improvement in instruments, it is well to stop for a moment and look back over the field. It is wise to compare the new methods of treatment with the old, and to determine whether they are, in every sense, superior to them. The old question, "Can catarrh be cured?" still comes to us, and I believe it can be answered affirmatively with much greater assurance and certainty than it could have been five years ago. Every physician has patients who serve as guide-posts along the road which has been traveled, showing how much could be accomplished at that time to cure catarrhal diseases of the nose, and indicating, too, how far surgery has advanced in heroism, if not in skill.

The physician at one time was quite content to excise small portions of enlarged tonsils, but now one sees, not frequently to be sure, pharynges which have lost all semblance of tonsils, and with them the pillars of the pharynx have also disappeared; nostrils, too, with septa thinned, and turbinated bones ground off. This last is said not so much as a criticism of any existing wrong as a warning

against too extreme surgical measures. Of all the diseases of the throat and nose, those requiring surgical interference are the least troublesome, both in determining the prognosis and in effecting a cure. They are the most satisfactory cases we meet with. It is much easier to remove a polypus than to cure a painful throat in which no cause of pain can be discovered. It is less difficult to apply the electric cautery to hypertrophied nasal tissue than to check supersecretion in a case where but few pathological changes can be seen, and so, where there is no opportunity to correct such changes with knife or cautery, the surgical treatment of catarrhal inflammations of the nose, if properly employed, is in no way more radical or more apt to produce disastrous results than the application of the various astringent, sedative, or stimulating drugs.

Almost any effect can be produced with the galvano-cautery electrode, depending entirely upon the manner in which it is used. It can be applied to the mucous membrane so gently as to be hardly more than an astringent, the very superficial ulceration produced causing only slight contraction of the tissues. Those who condemn this instrument should go far enough to specify what mode of using it they consider injurious. It might seem heroic treatment to apply a platinum wire at white heat to the sensitive congested nasal mucous membrane when in a condition of acute coryza, but it is much more rational treatment than to cover this same membrane with a solution of tannin or of nitrate of silver, a mode of procedure which has been generally employed.

Let us for a moment note the effects produced by these two different methods of treatment (and I refer to an article lately published by myself, "The Surgical Treatment of Colds in the Head"). In the first instance the actual cautery burns down the swollen tissues, leaving a small ulcerated surface. This affords relief in several ways: it opens the closed nostril so that the patient can breathe; it acts as an excellent counter-irritant, determining the inflammation from other and neighboring parts to this one locality, and so lessens greatly the area of inflammation. It does more than this; the character of the inflammation is changed from that of a coryza, which may be more or less peculiar, to that of a simple burn. In the other case when a supposed milder measure is employed, and some mild astringent solution is sprayed or brushed into the nasal cavities, it is possible that a little contraction of the tissues is effected for a short time, but this effect is very transient, and the inflamed mucous membrane quickly reacts, and is soon more congested and swollen

than before the application of the drug, so that the mild astringent has proved to be an irritant. This uncertainty in the action of medicinal applications has at all times been a most discouraging feature in the treatment of chronic nasal catarrh. One after another the various classes of drugs have been employed, but results have been far from satisfactory or uniform; the reaction of the astringent has proved most stimulating; the desired sedative has been most markedly irritating. How uncertain the action of remedies is when employed upon mucous surfaces in other portions of the body I do not know, but the nasal mucous membrane is a peculiar structure, which can not be acted upon by drugs with any degree of uniformity, and the reasons for this are evident. The nasal mucous membrane being constantly exposed to irritation of all kinds—foreign bodies in the air, rapid changes in the temperature of the atmosphere, etc.—the effect of drugs locally applied is greatly modified and frequently changed altogether by these external causes. If all extraneous influences could be excluded, if the nostrils could be closed to dirt, dust, and air, we could more exactly determine the action of medicines upon the nasal mucous membrane. The physiological action and the peculiar anatomy of the soft nasal tissues are factors which not only predispose them to catarrhal inflammations, but, what is more pertinent to this paper, they strongly compromise the benefit to be derived from all topical applications, rendering such applications ununiform and uncertain in their effects. They furnish, too, a strong argument for the adoption of surgical measures in the treatment of inflammations of the nasal mucous membrane. The cavernous tissue of the nasal cavities performs an important function, and it is well to take this into consideration in selecting the medicinal remedy or in planning the operation to be employed.

The value of having erectile tissue in the nose is appreciated when we remember that the nostrils warm air which is too cold, cool air which is too warm, moisten dry air, and strain out a large portion of the foreign particles which, without the nostrils, would enter the lungs. The hypertrophied masses of tissue over the anterior turbinated bones are sentinels which are almost automatic in their action, at times puffing up and almost occluding the nostrils when air is unfit for respiration, and at other times retracting and becoming almost invisible when their aid is not needed. I speak of this well-known physiological action of the erectile structure of the nose only to emphasize the fact, which I believe may be easily overlooked—

namely, that the tissues over the turbinated bones are not always hypertrophied (using that word in a pathological sense), even when they nearly occlude the nostrils, so that not every so-called "anterior hypertrophy" should be operated upon. The presence or absence of other symptoms of nasal catarrh should alone determine whether the tissues of the nose are normal or pathological. But, while the erection of the cavernous tissue of the nose serves a most valuable physiological purpose, it is unquestionably a most difficult structure to influence with astringent or sedative solutions. It repels all such remedies as it does foreign bodies in the air. All the drugs commonly used in nasal catarrh, without regard to their physiological action elsewhere, do little but irritate the nasal mucous membrane; and the astringent which is used in a subacute inflammation, instead of diminishing the trouble, oftentimes renders the process acute. These are a few of the disadvantages which have attended the use of medicines applied to the nasal mucous membrane. In a word, this method of treatment has been most discouraging, and it is not surprising that any surgical procedures which promise satisfactory uniform, and permanent results are looked upon with favor, and are coming to be more generally used. The difficulty in former methods of treatment has been, apparently, not so much in the selection of proper drugs as in the correct appreciation of the condition of the mucous membrane to be treated. What is the stage or grade of inflammation? What amount of active process is going on? And it is not sufficient to determine whether the inflammation is acute or chronic, for between these two conditions there are many minor stages, which it is necessary to appreciate in determining the proper plan of treatment to be followed. The physiological function and the peculiar anatomy of the nasal mucous membrane, and the extraordinary conditions under which it is placed, render a division of catarrhal inflammation of this membrane into stages, for the sake of intelligent therapeutics, well nigh impossible.

Dr. J. N. Mackenzie* has simplified matters in his classification of chronic nasal inflammations, and I believe that he correctly describes the successive pathological conditions that usually take place.

It is a matter of regret that the relation existing between the pathological appearances of catarrhal inflammations of the nose and its symptomatology can not be more precisely determined and stated. The physician rarely examines nostrils in which the nasal mucous

* J. N. Mackenzie, "Notes on the Classification, Diagnosis, and Treatment of Chronic Nasal Inflammation," "Medical News," April, 1885.

membrane presents a normal appearance; so-called "hypertrophies" can be discovered in almost every nose; enlarged blood-vessels are hardly ever absent, even though the patient is not a catarrhal one.

It is manifest that not every case presenting pathological conditions requires either medical or surgical treatment. In addition to pathological appearances as a means of diagnosis, I wish to suggest that more stress be placed upon the symptoms of the patient as a safe guide in deciding whether the case requires surgical methods of relief. I would not advocate less careful and painstaking examinations of the changes which have taken place in the nasal tissues; but the *special complaint* which the patient brings to the physician to relieve is, at least, something tangible for the physician to combat. It is good advice to the beginner in any specialty to make it his strong endeavor to control or alleviate the annoying symptoms which are distressing his patient. He must always keep this point in mind if he would gain the confidence of his client and score a success. The patient who breathes easily through his nostrils cares nothing for the removal of thickened tissue, if such an operation does not check at all the excessive secretion of mucus which he is constantly obliged to clear by violent exertion from the posterior nares. The majority of patients, though thoroughly ignorant of the *nature* of catarrhal disorders, have a very correct understanding of the *particular symptoms* which annoy them. What are the symptoms of nasal catarrh which should be relieved, and what pathological conditions producing these symptoms should be corrected by surgical measures?

In arriving at a diagnosis of catarrhal inflammations of the nasal tissues, we take into consideration the color of the mucous membrane, the degree of thickening of the tissues, the amount of secretion, and such subjective points as pain or disordered sensibility of any kind. In the matter of color of mucous membrane we have little of value to guide us in the treatment of nasal catarrh. The vivid redness of acute inflammation and the gray appearance of a chronic process described in text-books are here of slight diagnostic significance, for the coloring changes with every variation in the surrounding temperature. The common act of sneezing will change a pale mucous membrane to one of a bright-red color, and the nasal membrane which, judging from its color, we infer is acutely inflamed will, perhaps, in half an hour have lost all traces of congestion.

Very close to the question of color or congestion is the second point—the amount of swelling, the degree of thickening or of

hypertrophy; and here a great deal of information can be obtained as to the nature and extent of the catarrhal process and the advisability of surgical treatment. As has been said, there is scarcely an instance where socalled "anterior hypertrophies" can not be found; but are they "hypertrophies" in a pathological sense? Is the swelling of the soft tissues due at all to actual increase of connective tissue underlying the mucous membrane, or is it entirely produced by either active or passive congestion of the cavernous tissue? The function of these swellings must be constantly remembered in deciding how much of them should be removed. Nostrils are frequently examined in which the mucous membrane on both sides is found to be in contact with the septum, and it is difficult to see how any air can pass; but the patient assures the physician that he rarely has any difficulty in breathing through the nostrils, and this is explained by the fact that it does not seem necessary that the erectile tissue on both sides should be enlarged at the same time for physiological purposes, and, consequently, one nostril is usually open. The use of cocaine here will decide the question. Place a four-per-cent. solution on any of these swellings, and notice how much thickness of tissue remains after the cocaine has expelled the blood. If there is still hypertrophy enough to interfere with comfortable breathing, or if a portion of the obstruction is found to be due to an enlarged turbinated bone, the passages should be made larger by using the platinum electrode, or the small cautery loop, as recommended by Dr. Harrison Allen. It is manifestly a waste of time to endeavor to contract erectile tissue with astringent drugs. Such contraction must necessarily be very transient, and I believe that most medicines, applied to the nasal mucous membrane, are stimulating and irritating, and eventually cause permanent dilatation of the cavernous tissue. This is especially true of medicine sprayed into the nostrils, as the air-current serves as an additional irritant. Permanent enlargement of the soft tissues does more than to obstruct the nostrils; it steadily increases the amount of inflammation by the irritation produced in its contact with the cartilaginous septum. The irritation produced by such friction soon shows itself in heightened color, and a secretion of thin glairy mucus between the two surfaces—a condition of "cold in the head." The electric cautery should be used to destroy enough of the blood-vessels to prevent this contact between the soft tissue and the septum. By so doing, we remove one of the exciting causes of chronic hypertrophic catarrh. Great care, then, should be taken to destroy only

sufficient tissue to afford comfortable breathing, and at the same time to leave the erectile structure of the nose in a condition still capable of performing its physiological function. It is because the cautery and knife have been employed too freely that conservative laryngologists have deprecated their use. Certain it is that the nasal passages should be long and tortuous, that the inspired air may come in contact with as large a surface of the moist, warm mucous membrane, and for as long a time, as possible. I dare say we have all seen cases where surgical measures have been abused in the attempt to cure nasal inflammations. I saw a young man recently who had had his nose thoroughly cauterized on both sides, and he complained that he was more annoyed by sensations of heat and pain through the nostrils when he breathed than he had been by nasal obstruction before the operation. The mucous membrane on both sides showed long, deep bands of cicatricial tissue. The cautery had accomplished too much; the nostrils were too open, and too little mucous membrane remained to warm the air or to prevent the entrance of foreign bodies. The cold air was the cause of the neuralgic pains, and the dirt and dust, striking directly against the post-nasal pharynx, had produced a dry pharyngitis, just as that condition follows an atrophic nasal catarrh. I have seen two cases where acute inflammation of the middle ear followed extensive cauterization of the nasal tissues, not, as I believe, by extension of inflammation, for there was but slight inflammatory reaction, but by the sudden exposure of the Eustachian orifices to an increased current of cold air.

The width of the nostril should be considered in determining how much of the soft structures should be removed. The septum rarely occupies an exact median position, and it will not be necessary to use the cautery or snare so freely in the wide nostril as in the narrow one. In the ordinary cases of chronic nasal inflammation, three fourths of all that can be effected in the way of cure has been accomplished when the soft or bony structures of the nose have been so reduced in size by surgical measures that they can no longer prevent free nasal respiration.

Discussion.

Dr. Bosworth: I have heard two papers by Dr. Rice lately—one read before a society in New York, and this one. In reference to the first I have nothing to say; I agree with him thoroughly. With regard to the paper of to-day I wish to make some remarks. I consider the term "erectile tissue of the nose" as an unfortunate one. There is no evidence whatever to warrant the view that there is anything in the mucous

membrane covering the turbinated bones at all analogous to erectile tissue in other parts of the body. The author said that the physiological action of the erectile tissue of the nose was to swell up and exclude air from the nose. It does not have this function at all. It is merely a mass of blood-vessels, and physiologically does not swell up at all. It would be very strange, indeed, if it should be the function of the mucous membrane to prevent the entrance of air, and thus to compel it to enter through the mouth. Again, he said that, in regard to abnormities in the nasal chambers, all patients presented abnormities. In other words, there is no such thing as a normal standard. This is the view also of Morell Mackenzie, who declares that there are so many variations that there is no normal type. I do not admit this; I regard it as a mistake to say that there is no such thing as a healthy nose. In my dispensary and private work I see cases frequently with which I can find no fault whatever. The author also said that we need not remove hypertrophied tissue if the patient could breathe freely through the nose; for this he takes the patient's statement. I must say that here he is in error, as the patient's statement can not be relied upon. An obstruction may exist and not be recognized by the patient. He may say that he can breathe freely; but, after hypertrophy has been removed, he realizes that he never has breathed freely before the operation, and will tell you so. Patients can not decide whether they have catarrh or not. If they have been in a morbid condition for fifteen or twenty years, they are not able to say positively what it is to be well.

Dr. F. I. Knight: I have thought of the protective function of the turbinated bodies, to which my attention was drawn by the following case: A gentleman, a dentist by profession, found that his work was much interfered with by difficulty of breathing through his nose. I removed very large hypertrophies from the posterior ends of the turbinated bones, and the patient expressed the greatest gratification at the result; he could continue his work without continually stopping to walk around the room to get his breath. He subsequently sent several patients to me for the same operation. At the end of a year I met him, and he said that he believed that he was getting too much air; he had irritation in his nasopharynx, and laryngeal catarrh. He said that he feared that I had given him too much ventilation. This was an instructive case, and I think that the patient may have been right. There is another interesting point, to which Dr. Delavan called attention some years ago: Where there is a deviation of the septum, making a large space upon one side, the turbinated body of that side comes out to partially fill up this space. There is probably some good reason for this, as explained by Dr. Delavan. For my own part, I rarely look into a nose without finding something abnormal.

Dr. Shurly: Some three or four years ago I read a paper before this association, calling attention to the fact that there might be too much space for the passage of air through the nasal chambers, especially as a

result of too decided surgical interference, thereby giving cause for a more or less permanent atrophic nasal catarrh.

Dr. Mackenzie: The turbinated nasal corpora cavernosa are something more than mere plexuses of veins, for both inspection and histological examination show them to be formed of a tissue which in all essential respects may be regarded as the anatomical analogue of the cavernous structure of an erectile organ. Without entering upon the discussion of their uses, which are undoubtedly manifold, they unquestionably possess the faculty of sudden engorgement or erection, and I believe that this sudden reflex turgescence serves, among other things, the purpose of guarding the air-passages against the entrance of foreign particles of matter, noxious exhalations, etc. In this connection I would refer to some experiments made long ago in France. Horses were driven through clouds of dust and killed immediately afterward, when it was found that not a particle of dust had passed beyond the nasal fossæ. Now, it seems to me that this is best explained by the erection of the turbinated tissues. The nasal erectile, or, if you prefer it, contractile, bodies also occasionally become erect and engorged at a physiological epoch, such as the menstrual. If you ask, with Dr. Bosworth, What is the use of such engorgement? I answer, I do not know. Possibly the dilated cells may serve as collateral channels for the surcharged cerebral circulation, thereby bringing about relief of the headache and other congestive disorders incident to the menstrual period. The thyreoid gland, as we all know, enlarges in some women at that epoch; why, is not sufficiently apparent; but because we have no adequate explanation to offer, it obviously does not warrant us in denying the existence of a physiological fact.

Dr. Bosworth: If I might be allowed to explain, I should like to say that I did not assert that these bodies never swelled, but I stated that they never swelled as a physiological function. Dr. Mackenzie is referring to a pathological fact. I can not understand how man should have been created with such a clumsy contrivance as this device for shutting off the air from the nasal chambers and making it go through a much more vulnerable passage.

Dr. Allen: The existence of erectile tissue in the nose may be explained by the very short passage for the air. There is no question that the nasal chambers in man are exceedingly degenerate. In the first place, they are disproportionately small. The proper development of them is only to be found in long-faced animals, such as the horse. In man the brain cavity has gradually encroached upon the bones of the face, so that the nasal passages are very much shortened. It is a rule that structures in process of degeneration are always excessively variable, and paleontologists are agreed that as an organ approaches extinction it shows the greatest variety of forms; so that the great number of abnormities in the nose of civilized races of men, and its liability to disease, are the natural result of its degenerate condition. There is one point to be especially observed. It is that animals with short noses have these erectile bodies

in their nasal chambers. In a section of a cat's skull this is well shown; it is also seen in rabbits. It is also supposed to have some protective function. Now, in saying this, I do not say that we can allege the same function for the erectile tissue here as for that which exists elsewhere in the body; but we can state that its function is protective and obstructive; and, as a result of its presence, these bodies will swell up at times and become prominent.

Paper.

SEVEN CASES OF BUCCAL TUBERCULOSIS; WITH REMARKS UPON TUBERCULAR ULCERATION OF THE TONGUE.

By D. BRYSON DELAVAN, M. D.

THE subject of tuberculosis, even when restricted to the limit fixed by the title of this paper, is one of such great depth and breadth that to consider it fully would far exceed the bounds of an ordinary thesis. No such attempt will be made, therefore, upon this occasion, but attention will be called briefly to the records of seven well-marked cases lately observed by the writer, some features of which are new and, it is hoped, instructive, and to certain statistical deductions made from a survey of the literature of the disease as relating to the mouth in general, and in particular to tubercular ulceration of the tongue. The best apology for this, were any required, would rest in the fact that, although more than one hundred theses and recorded cases have of late years been published, nothing, so far as we are able to learn, has been done in the collective investigation of the disease. The urgent importance, it need hardly be said, of an early diagnosis, and the terrible rate of mortality attending the affection, render any information as to its clinical history and pathological character, and any definite knowledge as to what may be accomplished in the way of treatment, most desirable.

The question as to the possibility of the existence of true tubercle in the pharynx it is not necessary for our purposes to discuss. Whether we believe with Virchow on the one hand, or with Rokitanski on the other, there can be no question that in the disease known and universally recognized as tuberculosis there is found an ulcerated condition of certain mucous membranes which has such peculiar and well-marked characteristics that we are justified in regarding it as possessing an identity of its own, and in dealing with it as a distinct affection.

Through the kindness of Dr. John S. Billings, of the Surgeon-General's Office, Washington, a very complete bibliography of the subject has been placed at the disposal of the writer. By the aid of this, together with the original cases here presented, there have been found 114 well-authenticated cases, which as to their location are distributed as follows:

Of the tongue.....	51	cases,	or	45	per	cent.;
" " pharynx....	24	"	"	21	"	"
" " mouth.....	22	"	"	19	"	"
" " velum palati.	8	"	"	7	"	"
" " tonsils.....	4	"	"	3·5	"	"
" " nasal cavity.	5	"	"	4·5	"	"

From this it appears that by far the most frequent seat of the disease is the tongue, nearly one half of the recorded cases having been of this variety. This being true renders it of all the above-mentioned groups the most important, and a more careful study of the fifty-one cases is at once suggested. In considering the disease as manifested in other parts of the oral cavity, and in reviewing the statistics given above, together with the histories of the cases herein recorded, it will be seen that tubercular ulcers may occur upon any part of the mucous lining of the mouth. Even in the few instances here originally cited it has been found upon the tongue, the cheek, the gums, the tonsil, the velum palati, the posterior wall of the pharynx, and the roof of the mouth, while Volkmann and Hausemann have seen it upon the lip. Again, wounds and abrasions of the mouth and tongue may become infected and assume the condition of true tuberculous ulcers in patients already affected with the disease. Dr. Hunter Mackenzie calls attention to a case recorded by Fränkel, in which tubercular disease supervened in a case of specific ulcer of the lip, while Hansemann reports one in which tubercular ulceration of the mucous membrane of the mouth followed cancer of the lip. Hunter Mackenzie himself believes that tubercle and lupus of these regions may co-exist.

Turning now to the consideration of the cases in which the disease was located in the tongue, a sufficient number of them have been reported to render possible a certain amount of generalization. An attempt has been made, therefore, to analyze them, with the following results:

Of the fifty-one cases reported, there were found the records of twenty-six.

Of these, so far as stated, all but *two* were in males.

The disease was primary in nine cases, secondary in nine cases, not stated in eight cases. As to the location of the ulceration upon the tongue, it was situated anteriorly in fourteen cases, laterally in seven cases, posteriorly in one case, not described in four cases. The longest duration of a primary case found was two years and a half, and the shortest ten weeks.

The ages of the oldest and youngest patients in whom the disease occurred primarily were, respectively, seventy-one and eleven years; secondarily, sixty-three and twenty-three years.

The average age in sixteen cases was forty years.

It appears, therefore: I. That tubercular disease of the tongue, more common than any similar manifestations in other parts of the buccal cavity in the male, is in the female extremely rare.

II. That in a fair proportion of instances it occurs primarily.

III. That its most common location is in the neighborhood of the tip of the tongue.

IV. That it is sometimes found upon the side and dorsum of the tongue.

V. That posteriorly it is unique.

VI. That it may occur at almost any age, but that it is most common in middle life.

VII. That its duration, so far as may be judged from the foregoing, is short.

While secondary tubercular ulcers of the tongue may generally be diagnosticated with comparative ease, it can not be denied that in primary cases the signs and symptoms are so little distinctive as readily to mislead the observer. Indeed, in many cases in which operative measures have been resorted to, the tongue has been excised under the impression that the disease was epitheliomatous, and its true nature only recognized under the microscope.

So important is a correct understanding of the physical appearances of the tubercular ulcer that it has seemed well to quote the description of it given by Mr. Henry T. Butlin, in his admirable treatise "Diseases of the Tongue" (page 98). He says: "A completely developed tuberculous ulcer, not too broken down and sloughy, presents most of the following characters: The surface is uneven, pale, and rather flabby, granulated, or often covered with yellowish-gray viscid or coagulated mucus; the edges are sometimes sharp cut, sometimes beveled, seldom elevated, or everted, or undermined, not usually very red, but often redder than the surrounding tongue; there is very little surrounding induration; indeed, there

may be none; the adjacent portions of the tongue are generally a little swollen, sometimes decidedly swollen and sodden; the outline of the ulcer has no characteristic shape, but the borders are often sinuous and the shape is not unusually oval, or ovoid, or elongated. In the immediate neighborhood of the ulcer, and perhaps extending for some distance beyond it, are sometimes observed tiny yellowish-gray points or patches, or elevations, or, in the place of these, minute ulcers, which in time increase in size. The depth of the ulcer varies much; in the earlier stages it is superficial, but as the disease advances it may eat deeply into the substance of the tongue, and, eating more deeply at one part than another, may present different depths at different parts. It is almost invariably painful in the later stages, and there is almost always salivation. In this description some resemblance may be discovered to the tuberculous ulcers of other parts of the body; in the pale and flabby granulations, the sharp-cut or beveled edges, the absence of surrounding inflammation and induration."

The surface of the ulcer is sometimes described as "caseous," although this condition is by no means constant. Mr. Butlin goes on to say that tubercular ulcers of the tongue may commence in several different ways: by the breaking of a small blood bleb or vesicle, or by the formation of a tiny nodule or a little yellow point or patch, which gives way before it attains the size of a pea, or even half that size. Often it forms as the result of some continued local irritation or slight injury.

According to Volkmann, tuberculosis of the tongue may occur either in the form of ulcers or of distinct tumors, which gradually soften in the center. The former bear certain resemblances to malignant disease, the latter to gummata. These tumors may persist for a long time, and attain considerable size.

A case in which the lesion was superficial ulceration, with hard and thickened edges and a fissure extending deeply into the substance of the tongue, as described in Case I of this paper, was reported by Stewart, in the Philadelphia "Medical News," May 29, 1886.

The minute anatomy of tubercular ulcers of the tongue does not differ materially from that of the same lesion in other parts. While the presence of the bacillus of tubercle will furnish conclusive proof as to the real nature of the disease, failure to find the bacillus can not be considered as excluding it, as has been seen in several cases observed by the writer. This is readily explained by the exposed

position of the ulcer, which allows it to be subjected to the action of matter taken as food, and thus permits of the forced removal from its surface of any loose object located upon it.

Dysphagia, although not always present at first, soon develops, and is generally toward the later stages of the disease very severe. As the strength of the patient becomes impaired, sloughing of the sore may take place, its granular surface being lost and assuming more active characters; or, without actually sloughing, it may rapidly advance, until it has laid bare the muscular fibers of the tongue. The lymphatic glands of the angle of the jaw are often enlarged. The *prognosis* is absolutely bad. In every case which has come to the writer's knowledge, and in which the ultimate result has been reported, excepting the single instance of which a history is given in this paper (Case I), death has sooner or later resulted.

Treatment.—Butlin believes in the actual removal of the tubercular ulcer—1, because of the possibility of relieving the patient from future tubercular disease by infection through the ulcer: 2, because the disease is seldom difficult to reach or to remove, and the operation is far less formidable than that for carcinoma: 3, because the ulcer is in itself exceedingly distressing, and, through the distress which it occasions, leads to debility and death.

Mr. Butlin prefers this method to the use of the actual cautery, and believes that the latter offers no advantages over excision. Among the methods proposed by other surgeons, Körte recommends extirpation of the tongue by means of the galvano-caustic écraseur. Fereol, Stromeyer, Weber, and Schuh, on the other hand, object to extirpation, while Trélat and Fereol recommend the actual cautery.

In studying these opinions one is impressed with the fact that, while tubercular ulcers have been found in all parts of the tongue, from its tip to its base, and while they may exist in any degree of severity, from a small, superficial erosion to a deep and extensive ulceration, no difference as to treatment is suggested by the same observer, but the means respectively advocated are described by each writer as of general application. Between the galvano-cauterization or the excision of a small area of diseased tissue and the actual extirpation of the whole organ there is certainly a wide and important difference. It would be hard to understand why such diversity of opinion should exist, excepting upon the ground that few opportunities for observing the disease have presented themselves to the various authors quoted. Accepting the theory that local tuberculous infection may, if allowed to progress unchecked, become general,

there can be no doubt as to the necessity for the complete removal of the ulcer at the earliest possible date. That this should be accomplished with the least amount of irritation to the surrounding parts is also evident. In the opinion of the writer, the means to be employed, therefore, should be at once thorough and conservative. Their choice must depend upon the nature, extent, and location of the ulceration in the particular case in hand. Thus, if the disease be superficial, not very extensive, and situated within easy reach, several resources other than the extreme measure of extirpation present themselves. Of these the use of lactic acid must be mentioned. From the experience of the writer, and from the testimony of others, the good results of this remedy are by no means constant, for while under its application some ulcers are quickly healed, others show little effect beyond the appearance of a general improvement in condition without any decided tendency toward permanent repair. On the whole, however, its action is beneficial, and in some cases at least it has been curative. In Case I extreme dysphagia was allayed by application to the ulcers throughout their full depth of cocaine, while their general condition was greatly ameliorated by applications of a mixture of iodine, carbolic acid, and glycerin, the influence of which seemed to be antiseptic, alterative, and anæsthetic.

The old formula of morphine and iodoform, so useful in ulcerative conditions of the larynx, is of less practical value in tuberculosis of the tongue, from the greater difficulty of keeping the powder in contact with the surface of the ulcer. It still retains, however, a useful place in the therapeutics of the disease.

In the treatment of superficial ulcers of the tongue the galvano-cautery promises better results than any measure yet suggested. It should be applied at a high temperature, deep cauterization should be avoided, and, finally, not too great an extent of surface should be treated at one time. Of the advantages of the galvano-cautery over the thermo-cautery little need be said.

Another plan proposed is that of excision. In the case of superficial ulcers this may be accomplished by simply scraping the surface with a sharp curette or spoon. It occasionally happens that the surface of the ulcer is complicated by fissures, which extend from the periphery more or less deeply into the substance of the tongue. The suggestion of Mr. Butlin—namely, actual excision of the affected tissue—would seem to be applicable in such conditions, particularly where the ulcer is situated somewhat anteriorly. Extirpation of the whole tongue, although advocated by good authorities, must have

been meant by them to apply to cases in which the disease had produced deep and wide-spread destruction. In Case I, herein reported, the operation of extirpation seems somewhat radical, considering the limited amount of tubercular deposit present, and it is possible that a less severe procedure would have accomplished the removal of the infected area. On the other hand, it must be remembered that, to the great credit of the operator, the case is the first and only one on record in which this heretofore uniformly fatal disease has been treated with the result of establishing a complete and permanent cure.

In the management of tubercular ulcer in other parts of the buccal cavity and pharynx much greater difficulties are likely to present themselves, owing to the delicacy of the parts involved and to the greater inconvenience of reaching them. The best results from local treatment will be gained probably by first spraying the ulcer with a solution of resorcin, from one to two per cent. strong, or with a weak dilution of Dobell's solution, and then applying to it either lactic acid or, in some cases, a solution of iodine, or possibly, best of all, powdered iodoform, or the solution of iodoform in ether. Dysphagia may be allayed and the patient enabled to obtain the requisite nourishment by the application of a solution of cocaine or of morphine to the surface of the ulcer, while, if necessary, the process of deglutition can be much simplified by the use of a small-sized feeding-tube, through which food can be injected into the stomach.* Treatment, to be effective, must be carried out with thoroughness and with great regularity, and the general nutrition of the patient maintained with care.

Case I. *Primary Tubercular Ulcer of the Tongue.*—Arthur L., aged thirty-five, Ireland, laborer, married, family history good as far as known, previous history good.

Six weeks before first observation began to have pain in swallowing, located at base of tongue. This increased steadily until it became excessive. Complained of no other symptom. Remained at work for two weeks, but grew worse daily, and finally had to give up. Placed himself under medical treatment, with no improvement. Antisyphilitic treatment was followed by no good results. Aside from local trouble, is strong and well. On inspecting buccal cavity, the anterior part of tongue, the velum palati, and the pharynx are normal. Laryngoscopic examination of the base of the tongue, however, reveals the presence of two fissures with elevated edges and deep, sloughing walls. They are situated upon the right side between the circumvallate papillæ and the epiglottis, and seem to be about half an inch in depth. The larger one is one and a half by

* See "A Reference Hand-Book of the Medical Sciences," article "Dysphagia."

one inch in superficial extent. Palpation gives great pain and reveals induration of the edges of the lesion, not, however, well pronounced. The mucous membrane covering the right arytænoid cartilage is red and œdematous, as are the vocal bands.

In the center of the larger ulcer are many large, flabby granulations which are best detected by the finger, which also detects induration in the tissue of the tongue itself toward the left of the ulcer. Externally on the right side, under the angle of the jaw, is a small, hard lump, about the size of a chestnut. The corresponding region of the left side is normal. Slight fœtor of breath.

Dysphagia extreme and deglutition almost impossible. Pain constant and so severe as to produce insomnia and render life unbearable. The patient is anxious to submit to anything which will give promise of relief.

Applications of a four-per-cent. solution of cocaine resulted in readily and absolutely checking the pain, which would remain in abeyance for about five hours, deglutition meanwhile being easily accomplished. An application of a mixture of iodine and carbolic acid, repeated once on the third day, was followed by marked improvement. The patient's general condition, however, was deteriorating so rapidly that he was transferred to the New York Hospital, where complete excision of the tongue was immediately performed by Dr. William T. Bull.

A speedy recovery from the operation was made, and signs of general improvement at once began to manifest themselves, the patient gaining thirty-five pounds before he left the hospital. At no time before or since the operation has it been possible to detect the presence of disease of the lungs or of other internal organs.

The microscopic examination, made in the pathological laboratory of the New York Hospital, for which the writer is indebted to his friend, Dr. George L. Peabody, is as follows: "Many sections from edge of ulcer examined; all contain tubercular material, extending from an eighth to a quarter of an inch into tissue of tongue about ulcer. No glands found affected. A salivary gland, probably the submaxillary, cut away and found to be normal, except that here and there areas of inflammation were seen in its stroma."

Case II. *Secondary Tubercular Ulcer of Tongue.*—William B., aged fifty-four, United States, married, carpenter. Gave no specific history. Hard drinker. Six months before the date of this history was attacked with cough, anorexia, night-sweats, and vomiting. This continued for four months, when the cough subsided and the appetite improved. One month after the beginning of his illness the patient noticed an occasional soreness on the left side of the tongue, anteriorly. Two months later there appeared a papule in the same region. This was devoid of pain or redness. Soon after this the tongue became ulcerated along its left border for one inch, beginning at a point half an inch from its tip for a breadth of about one sixteenth of an inch. There was considerable lancinating pain. The ulcer has increased in size rapidly. When examined, the

patient was much emaciated. There was an irregular ulcer more than one inch in diameter to the left of the median line anteriorly. The surface of this was honey-combed and covered with decomposing food and sloughs. The edges were prominent and hard. The pharynx and soft palate were congested. There was enlargement of the sublingual gland of the left side, but no enlargement of the glands of the neck. There was severe dysphagia.

In view of the constant pain to which the patient was subjected, and the interference of this and the dysphagia with his nutrition and general condition, it was determined to remove the affected tissue. A partial excision of the tongue was therefore performed at the New York Hospital by Dr. William T. Bull. The patient subsequently died from asthenia.

For the notes of the microscopic examination of the specimen the writer is again indebted to Dr. Peabody. "The ulcer shows at its edges masses of tubercular tissue and some miliary tubercles situated both beneath the mucous membrane and between the muscular bundles. These masses vary much in size and shape, their centers are in great part cheesy, they contain numerous giant cells, and are the structural elements and arrangement of tubercle."

Case III. *Secondary Tubercular Ulcer of the Tongue.*—(For this case, of which the following is a synopsis of the history, the writer is indebted to his friend, Dr. Beverley Robinson, of New York.)

I. S. T., United States, aged forty-nine, married, coachman. Family history negative. Always enjoyed good health until three months before the date of this history, when he contracted a severe cold. Following this he had a cough, at first dry later attended with expectoration. Rapidly lost appetite, flesh, and strength. Had no night-sweats and no hæmoptysis. Six weeks before date of history began to suffer from hoarseness and sore throat. No other symptoms. When first examined was anæmic and emaciated. Physical examination of lungs revealed phthisis, second stage, throughout upper lobes of both sides. Laryngoscopic examination showed left arytænoid swollen and pyriform, both false cords much tumefied, left vocal band eroded. One week after this examination there appeared under the right side of the tongue a whitish patch, an inch by an inch and a half in extent. For a considerable distance around this the edges were reddened and indurated. The frænum linguæ and adjacent parts of the floor of the mouth were also indurated. At this time cavities began to appear in the lungs. Two weeks later the patch above mentioned had developed into an irregular superficial ulcer. Death resulted in about eight months from the beginning of the disease.

Case IV. *Primary Tubercular Ulcer of the Velum Palati.*—J. T., aged forty-three, Ireland, porter and night-watchman. Family history good, so far as known. Previous history excellent. Was somewhat dissipated when a young man, but denies specific disease and gives no evidence of having had it. Has always worked very hard. Was perfectly well up to ten months ago. Then strength began to fail without any assignable

cause, and cough, with slight expectoration, came on. Three months ago his throat began to be sore. This has increased steadily, particularly within the last two weeks, when marked dysphagia was developed and he began to emaciate rapidly. With all the dysphagia he has been able to swallow liquids without difficulty. When first seen about two months ago, and four weeks after the throat became affected, the patient appeared to be a poorly nourished, somewhat emaciated, but not cachectic-looking subject. Carefully conducted examinations of the chest, made by several good auscultators, failed to discover the presence of disease in the lungs. Examination of the pharynx revealed a series of ulcerations, beginning at the outer margins of the uvula on both sides and extending irregularly outward along the lower border of the velum about one inch. The ulcers were superficial, with yellowish-gray centers, rounded edges, and a very faint areola. Their general conformation, together with their absolute symmetry, suggested at once specific disease. The other characteristics of that condition, however, were not so well marked. The larynx, nasal passages, and posterior and lateral walls of the pharynx were congested, but otherwise normal. In addition, there was deep and somewhat extensive ulceration of the mucous membrane of the gum adjacent to the second bicuspid and first molar of the left upper jaw. The administration of anti-specific medicines was followed by no good results, the patient's condition, on the contrary, deteriorating under them, and his throat growing steadily worse. About one month ago the first signs of pulmonary involvement became evident. Three weeks later examination of the chest revealed prolonged expiration at right apex down to second rib, with coarse, moist râles at the left apex. Meanwhile the ulceration has advanced slowly in its superficial extent, but it has gradually involved the deeper tissues of the velum and has advanced somewhat posteriorly. Treatment by applications of iodoform has seemed to give little or no relief. Applications of lactic acid, undiluted, have been of temporary benefit. The contact of the acid with the affected surface has given almost no pain, but its general effect in improving the local condition has been unsatisfactory. Patient disappeared, so that no subsequent history has been obtainable.

Case V. *Primary Tubercular Ulcer of the Cheek.*—Eddie B., aged six, United States. Father died of phthisis. Mother living and healthy. Has two other children; both enjoy good health. Patient has complained of slight malaise for not more than two weeks. Was brought to the Demilt Dispensary on account of an ulcer upon the inside of the cheek, which had refused to heal under simple remedies and which evidently gave great pain and annoyance, especially in eating.

When first seen, the patient was apparently a tolerably well-nourished child, with a complexion and coloring of unusual beauty and brilliancy, and a bright, intelligent face.

Examination of the mouth showed a narrow, excavated ulcer, which extended along the line of the lower left molars for about an inch, in-

volving the deeper layers of the mucous membrane and having a yellow, sloughy center, and abrupt, well-defined edges. The teeth adjoining this ulcer were badly decayed and jagged. Mouth and pharynx otherwise normal, except a slight catarrh.

The decayed teeth were removed and the patient placed in the children's ward of the New York Hospital, in the service of Dr. Peabody, where, under the best conditions of hygiene and local treatment, the buccal ulcer made such slow progress toward improvement that the case excited unusual attention. About six weeks after entering the hospital, the ulcer being still unhealed, hectic, night-sweats, and emaciation, together with the pulmonary signs of tuberculosis, were developed, and after running a short course proved fatal. The autopsy showed acute general tuberculosis.

Case VI. *Secondary Tubercular Ulcer of the Tonsils.*—Patrick O'B., aged twenty-seven, Ireland, horse-car conductor. No direct history of hereditary tuberculosis. Parents not living; causes of death unknown. Brothers and sisters living and healthy. Has always led a steady and temperate life, and until within two years has enjoyed excellent health. Has never spared himself in the matter of hard work. Two years ago began to run down, the first symptom noticed being a laryngitis. Has grown steadily worse.

When first seen at the Demilt Dispensary, March 15, 1886, patient appeared a small, poorly developed, emaciated, profoundly anæmic victim of advanced phthisis. Large cavities at apices of both lungs, and coarse moist râles throughout both. Complained of extreme dysphagia, almost complete insomnia, incessant cough, night-sweats, occasional hæmoptysis, great depression, and rapid loss of strength. Laryngoscopic examination revealed extensive tubercular ulceration of the larynx and epiglottis. There was also an ulcer upon the middle of the surface of the right tonsil, about half an inch in diameter, another similar one, about half as large, upon the corresponding part of the left tonsil, and several other smaller ulcers on the roof of the mouth and on the gum adjacent to a decayed upper molar tooth. Pain in swallowing seemed to be referred chiefly to these points. Applications of iodoform gave little or no relief. Much temporary ease was gained by the use of cocaine.

April 7th.—A thorough application of pure lactic acid was made to the large ulcer on the right tonsil. Cocaine having been first applied, the effect was almost painless. Two days later reported himself as being much improved, and said that he had eaten and slept comparatively well. On inspection, the surface of the ulcer appeared cleaner, and its extent smaller. Another application of lactic acid was made, this time to both tonsilar ulcers.

12th.—Reported still greater improvement. The small ulcer on the left tonsil had disappeared, while that on the right was much reduced in size. He was given a solution of cocaine to use at home. From this the happiest results were derived in relieving the dysphagia, the insom-

nia, and the annoying sensation of dryness in the throat of which he had complained.

16th.—The remaining small ulcer of the right tonsil had almost entirely disappeared. The patient looked much better, and said that he ate with good appetite and slept well, and that he could swallow both solids and liquids, a thing which before had been impossible. Was greatly encouraged. This continued for about two weeks, when he began to run down very rapidly, and shortly died.

Microscopical examination of scrapings from the ulcers, made by Dr. William Stowell, microscopist to the Demilt Dispensary, showed "A small amount of fibrous structure of tonsil, with few epithelial cells. Greater part of specimen consists of fine granular matter with abundance of tubercle cells and occasional giant corpuscles. Few pus cells. None of the tubercular bacilli found by fuchsin staining."

Case VII. *Secondary Tubercular Ulcer of the Pharynx.*—(Through the kindness of Dr. George M. Lefferts the writer was allowed to study and report the following case:) Mr. I., aged thirty-eight, United States, gave a history of pulmonary phthisis dating back two years. About four months before the date of this observation an ulcer appeared upon the posterior wall of the pharynx. It has resisted treatment, and has steadily grown worse. When examined by the writer there was upon the posterior wall of the pharynx, to the right of the median line and a little below the level of the lower margin of the velum palati, an ulcer, oval in shape, about three quarters by seven eighths of an inch in diameter, with an excavated, yellowish center, around which was a distinct, somewhat elevated areola. The mucous membrane in the vicinity of this ulcer was anæmic, but otherwise healthy. Severe ulceration of the epiglottis also existed. There was marked dysphagia.

Discussion.

Dr. E. L. Shurly: I regard the paper just read as a valuable contribution to the subject. Primary tuberculosis attacking the palatine arches is frequently not recognized, and it may be mistaken for syphilis. I do not know how a diagnosis can be made from the ordinary appearances, and I do not feel at all sure that the bacillus can be regarded as an absolute indication that the case is one of tuberculosis. I will briefly refer to a case: A man, who was a smoker, presented himself with tuberculous ulcers of the mouth, on the cheek, and tongue. The bacillus was demonstrated to be present. The patient recovered and is well to-day. There was no evidence of a pulmonary lesion. In a case referred to me by a colleague, that of a woman suffering with stomatitis materna, I found the *Bacillus tuberculosis*. The condition of the woman was favorable with the exception of the tubercle; she subsequently recovered, and has become the mother of children since. It was not a case of buccal tuberculosis.

I believe that the tongue should not be excised, but that other means should be used to destroy the parts affected. The difficulty is in distinguishing these cases from ordinary stomatitis, which may take on a very malignant appearance as a result of irritation, but from which the patient will recover.

Dr. J. Solis-Cohen: I have never seen a case of primary tuberculosis of the tongue, or indeed of the mouth, so far as I know. In one case under my care the operation of removal of a portion of the tongue was undertaken, not for the relief of tuberculosis, but because it was supposed to be a case of epithelioma. I recall, too, a case, referred to me some years ago by Dr. Glasgow, in which I removed a tuberculous part of the tongue with the galvano-cautery. Until very recently I have depended greatly upon one sign in making a differential diagnosis of buccal tuberculosis, and that is intense pain on deglutition. Lately I have seen a case from the outset, in the person of a medical student with tuberculosis of the lungs and larynx, in whom I found an ulcer of the mouth, with elevated edges and surface covered with pus, resembling a tuberculous ulcer in its general aspect. The detritus scraped from the ulcer was examined by Dr. Griffiths and found to contain no tubercular bacilli. In this case the absence of pain was a marked feature. In another case I found sugar in the urine, and concluded that the ulceration was present in a case of diabetic phthisis and not in a case of tuberculous phthisis. In this case all treatment, including that by lactic-acid applications, was unavailing, and the ulceration steadily progressed. The patient is still living, but is not far from his end.

Dr. J. O. Roe: I have not seen a case of primary tuberculosis of the tongue, but I have had two cases of primary tuberculosis of the pharynx. One occurred in the person of a lady, thirty-five years of age, who had had trouble with her throat for about six months before I saw her, and had suffered a great deal. She was relieved for a time by counter-irritation and anodynes, but the pain on deglutition returned. I examined her throat, and found pale cicatricial tissue at the base of the tongue, passing down upon the epiglottis, and upward from this into the pharynx on both sides. The patient afterward died. The larynx was found entirely free from ulcers in this case, which is rather exceptional. The second case was that of a gentleman, about forty-five years of age, who had true tuberculous ulceration affecting the pillars of the fauces. He did not have tubercular ulceration of the larynx at that time; but there was infiltration of the arytænoid cartilages, with some difficulty in breathing. Strong applications could not be borne. I applied the iodide of amyl to the throat with very good result; the patient improved steadily, and is now well, weighing two hundred and twenty-five pounds.

Dr. G. W. Major: At a recent meeting of a medical society in Montreal, a case of tubercular disease of the tongue was shown, and I was asked to examine the larynx, where I found marked ulceration. The patient was much relieved by local applications.

Business Meeting.

Dr. Hartman moved that the programme be amended as regarded the afternoon session, and that the morning session continue until final adjournment. Carried.

Dr. Shurly moved that the Association proceed to the election of officers.

The motion was adopted, and Drs. Shurly and Mackenzie were appointed tellers.

Dr. Bosworth moved that the Secretary be directed to cast the vote of the Association for the nominees presented by the Committee. Adopted.

The tellers reported the following officers elected:

President.—E. Fletcher Ingals, M. D., Chicago, Ill.

First Vice-President.—E. Carroll Morgan, M. D., Washington, D. C.

Second Vice-President.—John N. Mackenzie, M. D., Baltimore, Md.

Secretary and Treasurer.—D. Bryson Delavan, M. D., New York.

Member of Council.—Franklin H. Hooper, M. D., Boston, Mass.

Librarian.—Thomas R. French, M. D., Brooklyn.

Dr. Bosworth moved that the next place of meeting be New York, the time of meeting to be appointed by the Council.

Upon division being called for by Dr. Daly, the motion was carried.

Dr. Delavan presented the name of Professor Ramon de la Sota y Lastra, of Seville, Spain, for election as Corresponding Fellow. Accepted.

The President called for the report of the Committee upon the Communication from the American Surgical Association.

Dr. Shurly asked to be instructed by the Association.

Dr. Bosworth moved that the name of the American Laryngological Association be added to the call for a Conference of Physicians and Surgeons to discuss the formation of a new association. Adopted.

On motion of Dr. Hartman, the thanks of the Association were cordially extended to the College of Physicians of Philadelphia for courtesies extended, in offering the hall to meet in, and the use of the library; and also that thanks be returned to the managers of the Pennsylvania Hospital and to the Union League and University Clubs.

Dr. Daly moved that, in token of the high appreciation in which his labors for this Association are held, the thanks of the Fellows are due, and are hereby tendered to the Secretary of the Association, for his valuable services.

The motion was carried with applause.

Dr. Delavan thanked the Fellows for the compliment paid him, and for the co-operation which they had extended to him, and by which his duties at this meeting had been rendered comparatively light.

In the absence of the President elect, the Second Vice-President was escorted to the chair, and after a few complimentary remarks he declared the Association adjourned.

APPENDIX.

APPENDIX.

Additional Papers.

THE FUNCTION OF THE RECURRENT LARYNGEAL NERVE. FROM EXPERIMENTAL STUDIES IN THE BIOLOGICAL LABORATORY OF THE JOHNS HOPKINS UNIVERSITY.*

By FRANK DONALDSON, Jr., B. A., M. D.

THE mode of action of the recurrent laryngeal nerve, supplying as it does muscles so important in their use, both phonatory and respiratory, and yet so opposed in their action, is at present a much mooted point. That this nerve supplies all the intrinsic muscles of the larynx with the exception of the crico-thyroid, and that it is chiefly a motor nerve, are well-known facts. It is a physiological fact, also, that the internal thyro-arytenoids, the lateral crico-arytenoids, and the transverse arytenoid, are the adductor (the phonatory) muscles of the larynx, and that the posterior crico-arytenoids are the abductor (the respiratory) muscles of that organ. As we have said, all these muscles receive their nerve-supply from the recurrent laryngeal. This nerve, then, must contain two sets of fibers, which innervate muscles of separate and distinct functions. How, and under what circumstances, does the constrictor or respiratory function of this nerve assert itself? How are these functions to be differentiated? Whence do the two distinct sets of impulses come? "Is the origin of the nerve-filaments which compose the recurrent laryngeal nerve as distinct as their function?"

This important question has, up to the present time, been unanswered, and we know of no experiments directly on this point until Dr. F. H. Hooper, of Boston, in 1885, published an important and

* Admission thesis to the American Laryngological Association, May, 1886, and published in "American Journal of Medical Sciences" for July, 1886.

interesting paper, entitled "The Respiratory Function of the Human Larynx, from Experimental Studies." In this article he considers the question stated above, and also whether (as the clinicians assert) the abductor fibers of the recurrent nerve are more vulnerable than those of the adductor. It was this paper which immediately attracted the writer's attention to this subject, and led him to undertake the experiments given below.

As my purpose then was, if possible, to verify and expand this author's experiments, I am compelled, in order to make myself intelligible, to go over somewhat the same ground in the elaboration of this paper.

Speaking generally, nervous impulses for the larynx start in the brain, the medulla, and the cord. That there is a motor center for the larynx is, to say the least, doubtful; and Delavan's * conclusions from the two cases cited by him—viz., "that this center is in the course of the third branch of the middle cervical artery, that it is toward the proximal end of this vessel, and that it is in the vicinity of the convolution of Broca"—are hardly justifiable in view of our scant knowledge of the subject, physiological and clinical. Nerve-impulses are transmitted to the larynx through the pneumogastric, the spinal accessory, and their anastomotic branches. The pneumogastric is connected, first, with the internal branch (which contains the medullary fibers) of the spinal accessory; second, with the facial nerve by the auricular branch; third, with the glosso-pharyngeal (an inconstant branch); fourth, with the hypoglossal; fifth, with the first and second cervical nerves; sixth, with the sympathetic system.

The manifold nervous impulses which may come through all these sources are carried to the larynx, then, by the superior and inferior laryngeal nerves, the anatomy and distribution of which need not be given here.

The part played by all these nerves in the innervation of the larynx is greatly in doubt.

The vagus and spinal accessory, however, are the nerves which immediately preside over the respiratory and phonatory functions of the larynx. The spinal accessory would seem to be chiefly a motor nerve (Bischoff, † Morganti, ‡ Longet, # Bernard ‖).

* "On the Localization of the Cortical Motor Center of the Larynx," "N. Y. Medical Record," p. 178, 1885.

† "Nervi acces," etc., Heidelberg, 1832.

‡ Extract in Schmidt's "Jahrb.," xlii, p. 280.

"Traité de Physiologie," vol. iii, p. 516.

‖ "Leçons sur la phys.," vol. ii, p. 244.

Bernard declares that the spinal accessory is the motor nerve for *phonation alone*, and that it has nothing to do with the respiratory function of the larynx, which, if I understand him right, is the view taken by Schech.* This latter is the afferent nerve supplying the mucous membrane and a motor fiber for the crico-thyroid muscle (denied by Navratil †); some observers hold that it also supplies a branch to the posterior arytenoid. The recurrent nerve, therefore, supplying all the muscles of the larynx except the crico-thyroid (though Türck‡ says that it furnishes fibers to this muscle also), and being essentially the respiratory nerve of the larynx, is the nerve with the innervation of which we are immediately concerned. How is it, then, that the impulses traveling along this nerve at one instant close and at the next open the glottis? How is it that at one moment the nerve-stimulus acts upon one set of muscles (the adductors), and at the next upon another and distinct set (the abductors)? Those most important muscles, the posterior crico-arytenoids, receive an abundant nerve-supply, and it is more than probable that the nerve-filaments in the recurrent are derived from a greater number of sources than those in the phonatory nerves. The experiments given below were undertaken to test Hooper's conclusions as to the innervation of the larynx. I shall give, therefore, in his own words, his reasoning:

"It is a familiar fact to all that, if anything other than air finds its way into the larynx, it produces, by reflex action, a sudden closure of the glottis. It is equally certain that, under normal conditions, the same contraction of the laryngeal muscles may be instantly called forth by direct stimulation of one or both of the recurrent nerves. Now, it may with reason be asked, How is it that this constricting action of the phonatory muscles is brought about if it be true that the nerve-fibers animating the dilators of the glottis are the stronger and the more numerous? Why should we not get *ab*duction of the vocal bands instead of *ad*duction on irritating the recurrent nerves? The phonatory muscles are to the respiratory muscles as five to two, and the closure of the glottis has always been ascribed to the superior numerical strength of these constrictors. Yet, if we compare bulk for bulk, the muscular fibers which compose the five muscles of phonation with those of the two respiratory muscles, we do not find that they are much, if any, in excess of the latter, and we venture to think that there is some other factor concerned in this phenomenon apart from mere muscular force. It may be sought, perhaps, in

* "Die Funct. d. Nerven u. Muskeln des Kehlkopfs," Würsburg, 1873.

† "Berl. klin. Woch.," 1871, p. 394.

‡ "Klinik d. Krankheiten d. Kehlkopfs," p. 439, Wien, 1866.

this important difference between the respiratory and the phonatory function of the glottis, namely, that while the respiratory muscles are ever on the alert, holding the glottis open during the entire healthy life of an individual, in his waking as well as in his sleeping hours, the phonatory muscles, on the other hand, are more dependent upon the *consciousness* of the individual in order to respond to any irritation. To explain: The phonatory function of the phonatory muscles could, as far as life is concerned, be dispensed with. Not so their constricting action with the view of excluding the passage of foreign bodies to the lungs. The constrictor muscles of the larynx are the sentinels who guard the approach to these vital organs. But they cease to act if the animal is in profound narcosis; they are asleep, so to speak, on their watch. A man in the condition known as 'dead drunk,' lying, let us suppose, on his back with his mouth open, would offer no obstacle to prevent any living insect that chanced his way from crawling in and out of his mouth, or meandering around in his larynx *à volonté*, without exciting reflex contraction of its muscles. The power of ether, chloroform, and other anæsthetics to impair the action of these constrictors is too well known to need mention. To carry this line of thought a little further, should we not expect that, provided we could preserve the organic life of an animal while its volition was at the same time completely abolished—should we not expect, we ask, under these circumstances, to get a dilatation of the glottis on irritating the recurrent nerves instead of a closure, for the posterior crico-arytenoid muscles are muscles of organic life? Indeed, we believe we should, and we submit the following experiments in support of that belief."

His experiments were performed upon dogs which were etherized, the mouth opened and the tongue drawn out so as to expose the larynx to view. The recurrent nerves were then exposed, cut, and stimulated at will. The results of the experiments apparently confirmed the theory given above, viz., that the constrictor functions of the larynx are dependent upon consciousness. And the conclusions drawn from them may be briefly stated as follows: That stimulation of the recurrent laryngeal nerve always produced abduction of the arytenoid on that side, provided the animal was deeply under ether; that, on removing the anæsthetic, the dilatation produced by stimulation became less and less as the animal regained consciousness, until finally contraction of the glottis followed; and that the abduction differed in different dogs. In other words, he concludes that the tendency of the glottis is to remain widely open, and that any given stimulus from the recurrent nerve would act upon the abductor muscles alone unless volition came into play, when the stimulus would exert the opposite effect and produce adduction. Such being this author's con-

clusions, I pass to my own series of experiments, undertaken to test the following points:

First.—Is it true that the constrictors cease to act during profound narcosis, or when consciousness is suspended from any cause?

Second.—Do we always get abduction of the arytenoids (dilatation of the glottis) on stimulation of the recurrent nerves, when consciousness is suspended?

Experiment I.—Medium-sized dog, under small dose of morphia. Slight movement of the glottis during quiet breathing. Recurrents exposed; stimulation of the right nerve produced complete adduction of that cord, and slight adduction of the opposite one. The same result followed stimulation of the left recurrent. The nerves were stimulated from time to time for an hour or more, with the same result. The animal now began to come from under the narcotic, and it was therefore tracheotomized and ether given, and, while there was still considerable movement of the glottis upon stimulation of right and left recurrent, I thought I noticed a slight *abduction* on the side stimulated; but in a few minutes, when the animal was deeply under the anæsthetic, and all movement of the larynx had ceased, stimulation of both recurrents separately produced a complete closure of the glottis. I am inclined to think, therefore, that the first apparent abduction was the result simply of the normal movement of the vocal cords in inspiration. In order now to do away with any possible movement of the larynx, the animal was made completely apnœic, and the right recurrent nerve cut. On stimulation, marked adduction was observed; the other nerve was now cut, and stimulation again produced adduction.

Experiment II.—Large dog, deeply under ether and chloroform. Stimulation of the right recurrent produced marked adduction. This nerve was now cut, and the left nerve stimulated, when marked adduction was produced. The right nerve was now traced to its final division, and the branches going to the posterior arytenoid, and those going to the other muscles, were tied and cut. Stimulation of the inferior or crico-arytenoid branch produced marked abduction, dragging the cartilage completely to the side. On the other hand, stimulation of the superior branch produced complete closure of the glottis, as was expected. Stimulation, however, of the branches simultaneously invariably produced adduction. These results were obtained over and over again. The dog meanwhile being profoundly anæsthetized, and the nerves being thus separate, I thought it would be well to see if I could get any proof of the fact, stated by clinicians, that the abductor nerve-fibers were prone to injury and disease. And, though the two nerves were exposed and cut for the space of an hour and a half, I could find no difference in their action; they responded equally to stimulation. That all possible consciousness might be done away with, the dog was bled to death; stimulation of either recurrent invariably produced adduction.

Experiment III.—Medium-sized dog, under morphia. Nerve dissected out to final distribution; stimulation resulted as in former experiment. Thinking now that the kind of stimulation might make some difference, a crystal of sodium chloride was placed upon the left nerve. The cord was alternately abducted and adducted as different fibers of the nerve were affected by the salt, though the general result was rather one of adduction. The result of pinching the nerve was, generally speaking, adduction.

Experiment IV.—Fair-sized dog, somewhat under morphia, later profoundly under ether. Right recurrent stimulated and adduction followed. The nerve was cut and adduction again resulted; there were no appreciable movements of the larynx at this time. The left recurrent, uncut, was now stimulated and adduction resulted. The latter nerve was cut and stimulation invariably gave adduction. Stimulation by pinching produced adduction. After the nerve had been somewhat injured it was stimulated below the point of injury to see whether one or the other fibers might have degenerated more rapidly, but adduction again resulted.

Experiment V.—Fair-sized dog, under ether only. The nerves were not stimulated until the animal was profoundly narcotized and all movement of the glottis had ceased, when stimulation of either nerve, cut and uncut, always produced adduction. The dog was killed, and after some minutes adduction was produced on stimulation. The strength of the current in all these experiments was always considerable, the induction coil being at about 10. In this series of five experiments, under no condition had abduction of either cord been obtained. The latter's results, seen by himself and others, must have existed, and so I was put to it to account for the great diversity in my own results. The experiments up to this point had been performed under like conditions, and sources of error excluded as far as possible. The next experiment was carried on with the utmost care, and with unexpected results. In the experiments given above, the induction coil was at 10, giving always a strong stimulus.

Experiment VI.—Medium-sized dog, under ether. Professor Martin having suggested that possibly the results obtained by Hooper were reflex (both Burkhard and Hermann stating that the recurrent had sensory as well as motor fibers), the right recurrent was stimulated and cut, but with the usual result, adduction.

Though the animal was deeply narcotized, there were still some movements of the glottis, and to do away with these the dog was accordingly made deeply apnœic. Under this condition it was observed that the cords came nearer together than in normal breathing, which is what might be expected, no impulses proceeding in this condition from the respiratory center. The nerve was now stimulated, and adduction was strongly marked. The right nerve was cut and stimulated, but with the same result. That all possible respiratory movements might be done away with and consciousness entirely removed, the medulla was destroyed and artificial respiration kept up. The right nerve was now cut, the induction

coil was moved out, and the stimulus made very weak (more by accident than intent), when, much to our surprise, *abduction*, distinct and prolonged, resulted. The stimulus was gradually increased, with the same result, until the coil stopped at 16, when *adduction* of the cord took place. This result was obtained again and again on stimulation of either nerve. Here, then, at last, we had the result obtained by Hooper. All consciousness in this case had been suspended. Was this abduction dependent upon unconsciousness and loss of volition? Hitherto we had obtained *adduction* under all circumstances, with the animal slightly, deeply, and entirely narcotized, and indeed when dead. Was not this abduction, just obtained, dependent upon the strength of the stimulus? Was not the abduction due rather to the greater irritability of the abductor muscles which caused them to answer to a much slighter stimulus than the adductor muscles? and was not this what we might expect from the vital importance of the former pair of muscles? Finally, did the abduction depend upon unconsciousness, or would we obtain the same result with volition at work?

Experiment VII.—Medium-sized dog, under ether only, right recurrent cut, and the animal well though not deeply narcotized: induction coil placed at 35; the stimulus was too weak, however, and no movement was visible. At 34 there was slight abduction of the arytenoid, which became more marked as the stimulus was increased. At 18 the abduction was greatest. At 16 the abduction was slight. At 14 the cord vibrated between abduction and adduction. At 10 adduction was most marked. At this last point slight contact produced a momentary abduction, which movement passed into adduction on full contact and stimulation. The abductor muscles seemed to lose their power and become exhausted upon strong and continued stimulation. The animal by this time had become deeply narcotized. In order to see whether volition would alter the results, the dog was allowed to come almost completely from under the influence of the anæsthetic; reflexes were numerous and marked. The coil was placed at 30, and abduction followed, as indeed it did until the coil reached 12, when a mixed movement resulted, and at 10 adduction followed stimulation. The change in the number at which adduction or abduction followed, may be explained by some exhaustion of the nerve from continued stimulation. Both the recurrents were now cut, and, thinking that the number of stimuli might make a difference, the interruptions were made in turn very slowly and very rapidly, but with no change in the results as given above. The experiment then confirmed the results of the previous one, and seemed to show that the abductor muscles were much more irritable than the adductors; and that abduction depended in no way upon volition, as the same result was obtained whether the animal was conscious or unconscious.

Experiment VIII.—Forty-eight hours previous to operation, about one inch of the right recurrent nerve had been excised, with a view to finding which, if either, set of fibers contained in it would degenerate

most rapidly. The dog was deeply etherized and the nerve found. The cut end was enveloped in a mass of inflammatory product from which it was freed and its end stimulated. With a feeble current the right cord, which was completely paralyzed, was strongly abducted, as it was indeed upon stimulation with all strengths from weakest to strongest. The animal was now allowed to come from under the ether almost entirely, with not the slightest change in the results, however; under no circumstances was adduction produced. The left nerve was stimulated, and with weak current abduction was obtained; with strong, a mixed movement. The dog was now killed, and after a short time, on stimulation of the right nerve, abduction invariably followed, while on the left side adduction could be obtained only with all strengths of stimulus, which fact, I think, is explained by supposing that the more irritable muscle, the posterior crico-arytenoid, dies more rapidly than the less irritable adductors.

Experiment IX was confirmatory of previous experiments, abduction depending upon the strength of the stimulus, and abduction and adduction obtained whether the animal was narcotized or not. One fact was impressed upon me by this experiment, viz., that after constant and strong stimulation the abductor muscles became exhausted, and any stimulation, therefore, produces adduction.

Proceeding now to the analysis of these experiments, we find that in the first five under no condition was abduction of either or both cords obtained, except, of course, where, as in Experiments II and III, the branch of the recurrent going to the posterior arytenoid itself was stimulated. Adduction of the arytenoid was obtained, however deeply the animal was anæsthetized, in all five experiments. In two cases (Experiments II and VI), where the animal was made thoroughly apnœic, and where for some seconds there was neither glottic nor respiratory movement, adduction resulted from stimulation. In two cases after the animal *was dead*, but before death of the nerves or muscles of the larynx, stimulation produced closure of the glottis. Under all these conditions of unconsciousness and narcotism, then, was adduction produced. This result followed, in these experiments, stimulation of the cut and uncut nerve; and followed chemical and mechanical, as well as electrical, stimulation. Again, in Experiment II, where the separate branches of the recurrent to the individual muscles were dissected out, and stimulated equally, neither showed a tendency to more rapid degeneration than the other.

My conclusions, then, from this first series of experiments are: 1. That the constrictor muscles of the larynx *do not cease to act during profound narcosis or during suspension of consciousness* from any cause; or, in other words, that their action is not dependent upon volition,

in the sense that they lose their power with the loss of volition. 2. That we do not always obtain abduction of the arytenoids when consciousness is suspended. Under what conditions, then, do we get abduction of the cords upon stimulation of the recurrent nerve? Such conditions must exist, for abduction of the cord has been obtained by Hooper, who considers that suspension of volition is the one condition under which stimulation of the recurrent nerve brings about abduction. What the conditions are under which these abductors act was, I think, partly discovered in the next series of experiments. In them it was found: 1. That the abduction obtained by Hooper was in no way reflex. 2. That abduction is in no way dependent upon the unconsciousness of the animal. 3. That it is with weak stimuli only that abduction of the cords takes place, which movement of abduction gradually passes into one of adduction as the strength of the stimulus is increased. 4. That this result invariably followed, whether the animal was slightly, deeply, or thoroughly narcotized; whether the animal was eupnœic or apnœic, when the dog had his *medulla destroyed*, and after *local death* had taken place. 5. That the rate of stimulation did not affect the general result. 6. That after strong and constant stimulation the abductor muscles became worn out and ceased to answer to stimuli. 7. That in apnœa the cords came nearer the middle line, the abductors receiving no stimulus in this condition from the respiratory center. Here then, I think, we have a suggestion at least as to the innervation of the muscles of the larynx. And again we state that volition, consciousness, or unconsciousness in no way affect the action of the laryngeal nerves or muscles. In our first series of experiments *adduction* resulted under all conditions of unconsciousness; in our second series, *abduction* in all conditions of consciousness or deep narcotism; we may, therefore, cast out volition as a factor in our problem. Abduction of the arytenoids was found to depend simply upon the strength (the rate did not change the result) of the stimulus; dilatation of the glottis followed always weak stimulation of the nerve. How is this result, then, to be explained?

It must remain for subsequent investigations to decide whether the greater irritability is in the nerve-fibers or in the muscle-fibers, but the fact remains that the abductor muscles respond to a much weaker stimulus than do the adductors. That their irritability is greater, was proved not only by the weaker stimulus to which they responded, but by the fact alluded to in Experiment IX: that, after continued stimulation, the muscle- or nerve-fibers of the abductors became ex-

hausted, and adduction only resulted from stimulation of the nerve. Again, in the several experiments where the nerves were stimulated after death, adduction only after a time could be produced, the more irritable fibers of the abductors dying most rapidly. The apparent contradiction in Experiment VIII, where, after section of the right recurrent two days previously, abduction only, under all circumstances and with all strengths of stimuli, was produced, may, I think, be explained by supposing that for some reason the fibers of the adductor muscles had degenerated more rapidly, which fact with others leads me to agree entirely with Dr. Hooper's statement that he can find no proof of the assertion of the clinicians that the abductor fibers of the recurrent are prone to disease. This clinical fact may be explained, however, by the theory of the greater irritability of the abductor muscle- or nerve-fibers. *For, in cases of unilateral lesion of the cords from an aneurism or tumor, the constant pressure exerted by either upon the nerve acts as a mechanical stimulus to it, and the more irritable abductors are, therefore, the first to show the result of this constant stimulation in their loss of function.* Upon these facts, then, I would explain the innervation of the larynx somewhat as follows: Breathing is an involuntary act, though the diaphragm and all the other muscles employed in respiration are voluntary muscles; and though respiration may be modified within very wide limits by the will, yet we habitually breathe without the intervention of the will. The larynx is an essential part of the respiratory apparatus, and is immediately connected with, and must receive impulses from, the respiratory center in the medulla, and its respiratory function is the most important; for the purpose of preserving life the glottis must be kept open, and so we find that the cords, even in normal breathing, at each inspiration are pulled slightly away from their apparently normal position between extreme abduction and extreme adduction. The fact that in deep narcosis the cords are pulled widely apart, would seem to show that stronger stimuli than usual are proceeding from the respiratory center to the abductor muscles; for in all deep narcosis the tendency is toward dyspnœa, and always in this condition normal respiratory muscles are called into greater play.

The constrictors of the larynx are apparently always in a state of partial tonic contraction, and ready for use at any moment. I found that, in every case where the dog was thoroughly apnœic, the cords came much closer together than in normal breathing; and this, it seems to me, is what we might expect, for in apnœa the respiratory center is at rest, and, the respiratory function of the larynx be-

ing for the moment in abeyance, the protective or constrictor function of that organ asserts itself. Again, it is well known that great changes can be brought about in the respiratory movements by the will; while, on the other hand, the respiratory center is the one most frequently affected by nervous impulses from various quarters. Is it not fair, then, to suppose—and I think the above experiments support the supposition—that both the respiratory and constrictor (or protective) functions of the glottis are governed by those laws which govern the rest of the respiratory apparatus?

It is well known that the pneumogastrics contain two kinds of fibers—one accelerating, the other retarding, regulating, or inhibitory. Ordinarily, the excitation of the former predominates, for, after division of one or both vagi, the respiratory rhythm becomes slower. Gentle stimulation of the central end of the divided vagus produces acceleration of the respiration; if, however, the stimulation is made strong, the action of the diaphragm is stopped—it is in a state of relaxation or expiration. This is particularly the case in the fatigue of the nerves, the result being due to the fact that the inhibitory fibers do not become so quickly exhausted as the accelerating. (Burkhard.)

The larynx, then, as we have said, being part of the general respiratory apparatus, its inspiratory and expiratory (constricting) functions are under the same nerve-control as the rest of the organs concerned in inspiration, and under no circumstances are these functions suspended.

The action of the constrictor muscles is second only in importance to that of the dilator muscles, and we do not think, in view of the results obtained above, nor upon general principles, that nature would allow so important a function to be suspended.

There seems to be a similarity between the nerve-fibers of the recurrent and those of the pneumogastric, and, on the whole, we are inclined to think that the great irritability mentioned above is in the nerve-fibers supplying the abductors; the two sets of fibers of the recurrent supply opposite sets of muscles, and may be likened to the two kinds of nerve-fibers composing the pneumogastric—the one answering to less, the other to stronger, stimuli.

Again, it seems to me that the abductor muscles are the more irritable, and are always ready to perform their part in the human economy; that the adductor muscles, on the other hand, are less irritable, but none the less ready, in consciousness or unconsciousness, to perform their function. It is a physiological fact that im-

pulses from almost every sentient surface, or passing along almost every sensory nerve, may modify the respiratory movements in one direction or the other, the slighter, feebler impulses tending to quicken the respiratory discharges, the stronger, larger impulses tending to arrest or inhibit the respiratory discharges from the medulla—and the movement of the larynx would be in keeping with that of the rest of the respiratory apparatus.

Finally, the constrictors of the larynx, needing a stronger stimulus to bring them into action, *may* find that stronger stimulus in the numerous reflexes which arise upon the introduction of any foreign body into that organ.

My thanks are due my friend Professor Martin both for the use of his laboratory and for valuable help.

ADDENDA.—*May, 1887.*

I desire to add a few words in explanation of some statements in this paper.

First.—I do not wish to be understood as denying that there is a *peripheral effect of ether.*

Now, this was what Hooper found when, after a full dose of ether, he got abduction. But he made the mistake of attributing the abduction to *suspension of consciousness* by the anæsthetic, and not to its peripheral effects. My point was to prove that consciousness or volition was not a factor in laryngeal innervation.

Second.—In the above paper I stated that my experiments gave no confirmation of Semon's conclusion that the abductor muscle or nerve-fibers have a special proclivity to disease. On further consideration, I find this statement too broad. Whereas I was at first inclined to deny Semon's statement (on scientific grounds), I now go almost as far as he does—*i. e.*, I am fully convinced that *the abductor fibers are much more irritable and have much less power of resistance than the adductor fibers, and that they die sooner;* though I can not say that I have as yet any experimental (histological) proof that they degenerate more rapidly, after chemical, mechanical, or electrical stimulation, than the adductor fibers.

In the experiments related in the above paper, I also found that the abductor muscles responded to a much weaker stimulus than the adductors did, and that this result invariably followed—whether the dog was slightly, deeply, or thoroughly narcotized, whether the animal was eupnœic or apnœic—when the medulla had been destroyed and after local death had taken place. This important fact (that

the adductor muscle does respond to a slighter stimulus) has been confirmed by Semon and Horsley. In a paper, "On an Apparently Peripheral and Differential Action of Ether upon the Laryngeal Muscles," in the "British Medical Journal" for August 28, 1886, page 405, they say: "With weak stimuli, other things being equal, *abduction* of the vocal bands generally occurs, as has been recently shown by F. Donaldson, Jr. We have repeated in a few instances Dr. Donaldson's experiments, and have, on the whole, obtained similar results." I have abundantly confirmed my original statements on this point. See paper before this Association, May 27, 1887.

Again, I found (and this, too, has been confirmed by Semon and Horsley) that, when after death the recurrent laryngeal nerve was stimulated, *abduction* disappeared long before *adduction*, which would certainly show that the *abductors die* or become exhausted first.

In view of the foregoing facts, I am forced to agree with Semon that those cases where the vocal band is found fixed in phonatory position are true paralysis of the *abductor* muscle, and not spasm of the *adductor* muscles.

Finally, it is but right to confess that my experiments tend to confirm Semon's conclusion.

SUPPLEMENTARY

CATALOGUE OF THE LIBRARY

OF THE

AMERICAN LARYNGOLOGICAL ASSOCIATION,

1886–1887.

By THOMAS R. FRENCH, M. D.,

LIBRARIAN.

Allen (Harrison). On Digital Examination of the Nasal Chambers, and Denudation of the Turbinated Bones in the Treatment of Chronic Nasal Catarrh. 1886.

— On the Headaches which are associated Clinically with Chronic Nasal Catarrh. 1886.

Archivii Italiani Laringologia, Periodico Trimestrale. Fondate e Diretto dal Prof. Ferdinando Massei. Anno v, 1885–'86.

Beschorner (Oscar). Subcutane Injectionen von Cocain.-Salicylic. bei Asthma und nervösem Husten. 1886.

— Über "Heufieber" und dessen Behandlung. 1886.

Boecker (A.). Die Beziehungen der erkrankten Schleimhaut der Nase zum Asthma und deren Behandlung. 1886.

Bresgen (Maximilian). Die Beziehungen der erkrankten Nasenschleimhaut zum Asthma und dessen rhinochirurgische Heilung. 1886.

— Die sogenannte Rachentonsille: ihre Erkrankung und Behandlung. 1887.

— Ein Fall von Spasmus Glottidis, bedingt durch Aorten Aneurysma. 1887.

— Enstehung, Bedeutung und Behandlung der Verkrümmengen und callösen Verdickungen der Nasenscheidewand. 1887.

— Epistaxis.

Burnett (C. H.). The Frequent Dependence of Disease of the Ear upon Catarrhal Disease of the Nose. 1886.

Chiari (Ottokar). Des Néoplasmes de la Cloison des Fosses Nasales.

— Rhinologische Kasuistik. 1885.

Chiari (O.) und Riehl (G.). Rhinosklerom der Schleimhaut. Klinische Studie. 1885.

Cohen (J. Solis-). A Case of Thyrotomy for Morbid Growth, with Subsequent Development of Epithelioma in the Cutaneous Cicatrix, but without Involvement of the Interior of the Larynx. 1883.

— Address in Medicine. 1881.

— Case of Cystic Adenoma of Base of Tongue; with Retro-pharyngeal and Cervical Adenoma. 1880.

— Del Valor Pronostico de las Manifestaciones locales observades en la tuberculosis de la laringe. 1884.

— Diseases of the Nose. Diseases of the Pharynx. Extracted from Wood's Supplement to Ziemssen's "Encyclopædia."

— Does Excision of the Larynx tend to the Prolongation of Life? 1883.

— El Bocio. 1883.

— Galvano-caustic Method in Nose, Pharynx, and Larynx. 1881.

— Hyperdistension of the Air-cells as a Therapeutic Measure. 1880.

— On the Elements of Prognosis and of Therapeusis in Tuberculosis of the Larynx. 1883.

— Some Clinical Considerations on Access to Benign Intra-laryngeal Neoplasms through External Incisions; as illustrated in a Small Group of Personal Observations heretofore unreported. 1880.

— The Throat and its Diseases. Extracted from Wood's "Household Practice."

— Three Cases of Pressure upon the Recurrent Laryngeal Nerve from Different Causes, with Fixation of the Left Vocal Band in the Phonatory Position. 1886.

— Tuberculosis as manifested in the Larynx. 1883.

— Un Caso de Parálisis de la cuerda vocal izquierda en extrema abduccion á consecuencia de una herida incisa en el cuello. 1885.

Congres International Periodique des Sciences Médicales. 8me Session, Copenhague, 1884. Compte-rendu des Travaux de la Section de Laryngologie.

DeBlois (T. A.). Cases of Laryngeal Œdema. 1886.

Delavan (D. B.). Air Passages, Foreign Bodies in. 1885.

— Catarrh. 1886.

— Congenital Malformations of the Larynx. 1887.

— Dysphagia. 1886.

— Erysipelas of the Larynx. 1887.

— Fractures and Dislocations of the Larynx. 1887.

— Glottis, Œdema of. 1886.

— Larynx, Photography of. 1887.

— The Laryngoscope. 1887.

Donaldson (Frank). Personal Observations of the Value of Cocaine in Nose and Throat Surgery. 1885.

Donaldson (Frank, Jr.). A Study of Diaphragmatic Pleurisy. 1886.

— The Function of the Recurrent Laryngeal Nerve from Experimental Studies in the Biological Laboratory of the Johns Hopkins University. 1886.

Fraenkel (B.). Angina.

— Angina lacunaris und diphtherica. 1886.

— Croup.

Fraenkel (B.). Demonstration eines Speculum narium.
— Discussion über die Anwendung des Cocain. 1885.
— Eine einfache Methode, den Stimmfremitus indirect wahrzunehmen. 1884.
— Ein Fall von Worttaubheit. 1881.
— Inhalationsapparat für ätherische Oele. 1885.
— Kehlkopfsstenose in Folge fehlender Glottiserweiterung bei der Inspiration. 1878.
— Schlundkopf. (Pharynx-Krankheiten.)
— Ueber Beleuchtungsapparate, der ohne weitere Hülfsvorrichtung die Demonstration des Bildes an einen zweiten Beobachter gestatten. 1876.
— Ueber den Zusammenhang von Asthma nervosum und Krankheiten der Nase. 1881.
— Ueber die Anwendung des Iodoforms auf Schleimhäute. 1882.
— Ueber die Farbung des Koch'schen Bacillus und seine semiotische Bedeutung für die Krankheiten der Respirationsorgane. 1884.
— Zur medicamentösen Lokalbehandlung hypertrophischer Tonsillen.
French (T. R.). The Effects of Diseases of the Nasal Passages on other Portions of the Respiratory Tract. 1886.
— The Laryngeal Image as seen in Photographs taken during the Production of Tones in the Singing Voice. 1886.
Gerhardt (C.). Laryngoskopie und Diagnostik. 1885.
— Lungenphthise, tuberculöse Geschwüre des Magens und Darmes, heilendes tuberculöses Geschwür des Kehlkopfes, Schrumpfende, linksseitige Pleuritis, Pneumopericardie. 1881.
— Nachtrag zu der Arbeit über syphilitische Erkrankungen der Luftröhre.
— Ueber syphilitische Erkrankungen der Luftröhre.
— Zur Casuistik der eingeathmeten Fremkörper.
— Zur Casuistik der Hirnkrankheiten. 1864.
Gleitsmann (J. W.). Laryngeal Hæmorrhage. 1885.
— Mundathmung, ihre Ursachen, practische Bedeutung und Behandlung. 1886.
Goris (Ch.). Note sur l'Iodol dans le Traitement de l'Otite Purulente Chronique. 1887.
Guinier (H.). Contribution à l'Étude des Tumeurs Éphémères ou non permanentes du Larynx. 1881.
— Contribution à l'Histoire Médicale de Cauterets. 1884.
— Deglutition de Travers. 1881.
— De la Diversité des doses dans la Boisson des Eaux Sulfureuses de Cauterets. 1884.
— Des Conditions Physiologiques de la Laryngoscopie. 1881.
— Des Conditions Physiologiques de la Laryngoscopie et des Opérations intra-laryngiennes moyen pratique d'obtenir la tolérance gutturale. 1882.
— Du Mycosis de l'arrière-gorge.
— Du Role de la Portion Libra de l'Epiglotte et des Fossettes Glosso-épiglottiques. Contribution à l'Étude de la Déglutition. 1883.
— L'Étude du Gargarisme Laryngien. 1868.
— Traitement Curatif des Maladies de la Gorge et du Nez et des Surdités Catarrhales—Methode et Pratique du Gargarisme Laryngo-nasal. Paris: Troisième édition. 1881.

Hooper (F. H.). Adenoid Vegetations in the Naso-pharyngeal Cavity. 1886.
— Concerning the Positions of Paralyzed Vocal Bands. 1886.
Jarvis (W. C.). A New Electric Light. 1885.
— Catarrhal Affections of the Nasal Passages as a Cause of Pulmonary Phthisis, with Special Reference to the Question of Heredity. 1885.
— Chronic Irritative Hyperæmia of the Larynx. 1882.
— The Etiology and Treatment of Nasal Catarrh with Special Reference to the Deviated Septum. 1885.
— The Healing of Ulcers in Laryngeal Phthisis. 1883.
— The Pathology and Surgical Treatment of Hypertrophic Nasal Catarrh. 1881.
Jonquiere (G.). Bleibende Lähmung der Abductorenfesern eines Stimmbandes durch Druck auf den Recurrens, verbunden mit vorübergehender Parese der Adductoren. 1884.
— Ein Fall von Aphonia spastica hysterica. 1883.
— Neuer Beitrag zur Kenntniss des phonischen Stimmritzenkrampfes bei Hysterischen. 1884.
Knight (C. H.). Abscess of the Tongue; with report of a case. 1887.
— A Case of Perichondritis of the Larynx; Necrosis of the Cricoid. 1887.
— Paralysis of the Velum Palati in Acute Naso-pharyngitis. 1887.
Labus (Carlo). Il Cateterismo e la Dilatazione Meccanica nella stenosi della Laringe. 1876.
— La Cocaina nella Pratica Laringojatrica. 1883.
— La Laringoscopia e l'Elettricità nei sordo-muti. 1871.
— Laringoscopio Portatile. 1876.
— Operazioni Laringoscopiche. 1874.
— Papillom am 5. Luftröhrenknorpel auf laryngoscopischen Wege entfernt. 1886.
— Polipi al 5°, 8°, 9° Anello Tracheale esportati per le vie Naturali. 1881.
— Prelozione al Corso di Laringoscopia tenuto nell' anno Scolastico, 1878, alla R. Universita di Pavia.
— Removal of a Tracheal Neoplasm by Operation through the Natural Passages. 1880.
— Tumore Fibroso-Cistoideo della vera corda Vocale destra Esportazione pe via Laringoscopica Guarigione. 1880.
Major (G. W.). An Improved Nasal Traction Snare and Écraseur, a Nasal Spud or Denuder. 1887.
— Prolapse of the Laryngeal Ventricles. 1887.
— The Treatment of Laryngeal Tuberculosis by Submucous Injections of Lactic Acid. 1886.
Martin (H. N.) and Donaldson (F., Jr.). Preliminary Account of Experiments in Regard to the Circulatory and Respiratory Changes observed in Animals placed in the Pneumatic Cabinet. 1886.
Matterstock (G. K.). Ueber Vox Cholerica. 1874.
Meyer (Wilhelm). Trautmann. Anatomische, pathologische und klinische Studien über Hyperplasie der Rachentonsille, sowie chirurgische Behandlung der Hyperplasie zur Verhütung von Erkrankungen des Gehörorgans.
Mills (T. Wesley). An Examination of some Controverted Points of the Physiology of Voice, especially the Registers of the Singing Voice and the Falsetto. 1882.

Morgan (E. C.). Submucous Laryngeal Hæmorrhage. 1885.
— The Administration of the Hypophosphites in Powder. 1885.
— The Question of Hæmorrhage following Uvulotomy. 1886.
— The Value of the Snare in performing Uvulotomy. 1885.
Moure (E. J.). Manuel Pratique des Maladies des Fosses Nasales et de la Cavité Naso-Pharyngienne. Paris, 1886.
Prince (David). Erysipelas and Other Septic and Infectious Diseases Incident to Injuries and Surgical Operations prevented by a Method of Atmospheric Purification.
Revue Mensuelle de Laryngologie, d'Otologie et de Rhinologie. Fondée et Publiée par le Docteur E. J. Moure. Paris, 1886.
Rice (C. C.). Adhesion of the Soft Palate to the Wall of the Pharynx. 1885.
— Unusual Causes of Coughing. 1886.
Schaeffer (Max). Demonstration von Beleuchtungsapparaten. 1885.
— Epistaxis. 1886.
— Ueber Rhinolithen. 1885.
Stoerk (Carl). Ueber die Verhinderung der Granulombildung nach der Tracheotomie. 1887.

NAMES AND ADDRESSES OF FELLOWS.

Allen, Harrison, 117 South 20th Street, Philadelphia, Pa.
Asch, Morris J., 5 West 30th Street, New York.
Bean, C. E., 3 Wabasha Street, St. Paul, Minn.
Bosworth, F. H., 26 West 46th Street, New York.
Chapman, S. H., 193 Church Street, New Haven, Conn.
Cohen, J. Solis, 1431 Walnut Street, Philadelphia, Pa.
Cohen, S. Solis, 1431 Walnut Street, Philadelphia, Pa.
Daly, W. H., 71 Sixth Avenue, Pittsburgh, Pa.
De Blois, T. Amory, 5 Park Square, Boston, Mass.
Delavan, D. B., 1 East 33d Street, New York.
Donaldson, Frank, 510 Park Avenue, Baltimore, Md.
Donaldson, Frank, Jr., 510 Park Avenue, Baltimore, Md.
Douglas, J. H., 48 East 26th Street, New York.
Duncan, W. F., "The Mystic," West 39th Street, New York.
French, Thomas R., 469 Clinton Avenue, Brooklyn.
Glasgow, William C., 2847 Washington Avenue, St. Louis, Mo.
Hartman, J. H., 44 Franklin Street, Baltimore, Md.
Hitchcock, U. G., 51 West 29th Street, New York.
Holden, Edgar, 13 Central Avenue, Newark, N. J.
Hooper, F. H., 59 Marlborough Street, Boston, Mass.
Ingals, E. Fletcher, 64 State Street, Chicago, Ill.
Ives, F. L., 117 East 30th Street, New York.
Jarvis, William C., 25 East 31st Street, New York.
Johnson, H. A., 4 Sixteenth Street, Chicago, Ill.
Johnson, Woolsey, 230 West 43d Street, New York.
Johnston, Samuel, 80 West Monument Street, Baltimore, Md.
Kealhofer, R. H., 602 Garrison Avenue, St. Louis, Mo.
Knight, Charles H., 20 West 31st Street, New York.
Knight, F. I., 131 Boylston Street, Boston, Mass.
Langmaid, Samuel W., 129 Boylston Street, Boston, Mass.
Lefferts, George M., 6 West 33d Street, New York.
Lincoln, Rufus P., 22 West 31st Street, New York.
MacCoy, Alexander W., 1417 Walnut Street, Philadelphia, Pa.

Mackenzie, John N., 141 North Charles Street, Baltimore, Md.
Major, George W., 82 Union Avenue, Montreal.
McSherry, H. Clinton, 189 North Howard Street, Baltimore, Md.
Morgan, E. Carroll, 918 "E" Street, Washington, D. C.
Mulhall, J. C., 2201 Olive Street, St. Louis, Mo.
Porter, William, 3137 Lucas Avenue, St. Louis, Mo.
Rankin, D. N., 31 Sherman Avenue, Alleghany, Pa.
Rice, C. C., 115 East 18th Street, New York.
Robertson, J. W., 115 Cass Street, Detroit, Mich.
Robinson, Beverley, 37 West 35th Street, New York.
Roe, John O., 28 North Clinton Street, Rochester, N. Y.
Sajous, Charles E., 1632 Chestnut Street, Philadelphia, Pa.
Seiler, Carl, 1346 Spruce Street, Philadelphia, Pa.
Shurly, E. L., 25 Washington Avenue, Detroit, Mich.
Wagner, Clinton, 341 Fifth Avenue, New York.
Westbrook, B. F., 174 Clinton Street, Brooklyn, N. Y.

SERIAL

RF
1
A5
v.8

American Laryngological
Association
Transactions of the
annual meeting

GERSTS